



Public Water Supply Protection Plan

Town of Amherst
Atkins Reservoir,
Pelham Reservoir System,
and Lawrence Swamp Aquifer

Prepared For:

Massachusetts Department of
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Bureau of Resource Protection

and

U.S. Environmental Protection Agency
Region I

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Tighe & Bond

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This report is a combined surface water supply and groundwater supply protection plan for the Town of Amherst developed to improve protection efforts within the Atkins Reservoir (PWS ID #1008000-01S) and Pelham Reservoir (PWS ID #1008000-02S) watersheds, and the Lawrence Swamp Wells (PWS ID #1008000-01G, -02G, -03G, -04G, -06G and -07G) recharge areas. This Plan applies to the Zones A and B of surface water supplies and the Zones I and II of groundwater supplies that serve the Town of Amherst.

This protection plan was developed using information supplied by the Massachusetts Department of Environmental Protection (MADEP), and the Towns of Amherst, Shutesbury, Pelham and Leverett. Mapping is based on the February 2002, release of the Massachusetts Geographic Information System (MassGIS). In addition, a field survey of land uses and potential contamination sources was conducted for the land area included in the protection areas.

Water supply protection is a strategy aimed at preventing drinking water contamination by managing the land area that supplies water to a well and to surface water reservoirs. This plan is intended as a planning tool for the Town of Amherst. Water supply planning is also an integral part of the MADEP Source Water Assessment and Protection Program (SWAP). Under SWAP, MADEP has mapped the protection area for all public water supplies, identified potential sources of contamination in the protection area, and assessed the susceptibility of water supplies to contaminants.

1.1 ACKNOWLEDGEMENT OF SUPPORT

This project has been financed with Federal Funds from the United States Environmental Protection Agency (USEPA) to the MADEP under a Safe Drinking Water Act State Revolving Loan Fund Set-Aside Grant. The contents do not necessarily reflect the views and policies of the USEPA or the MADEP, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

1.2 PROJECT BACKGROUND

The Town of Amherst (PWS ID# 1008000) is supplied with water from two surface water sources and five groundwater sources. The Atkins Reservoir (01S), located in Shutesbury, has a water surface area of 51 acres and a storage capacity of 200 million gallons at its maximum water elevation of 446 feet (NGVD). The reservoir has a MADEP safe yield of 1.25 million gallons per day (mgd). Two primary tributaries, Dean Brook and Nurse Brook, supply the Atkins Reservoir. The Town of Amherst transfers water from Dean Brook to Nurse Brook through the use of a diversion structure located approximately one-quarter mile upstream of the Atkins Reservoir.

The Town's other surface water supply source is the Pelham Reservoir System, comprised of the Hill Reservoir, the Hawley Reservoir, and the intake reservoir (collectively designated as 02S). The combined reservoir system has a total water surface area of 14.3 acres and a total storage capacity of 46 million gallons. The reservoir system has an estimated safe yield of 0.9 mgd.

The five groundwater sources of the Town of Amherst all draw from the Lawrence Swamp Wellhead Protection Area. The Lawrence Swamp Wellhead Protection Area lies in the southeast section of Amherst and the northwest section of Belchertown. Well #3 (03G), the Brown Well, located in Belchertown, is the primary groundwater source that, together with the surface sources, supplies nearly 80% of the Town's annual demand. The Town's other four groundwater wells, located in Amherst, supplement the other sources as needed. The five groundwater sources have a collective MADEP-approved yield of 4.7 mgd, though current equipment limits capacity to 4.5 mgd. A table summarizing Amherst's water supply well information is provided below. All of the wells listed in this table are herein referred to as the Lawrence Swamp wells.

Well Name	PWS Source ID
Well #1	1008000-01G
Well #2	1008000-02G
Well #3 - Brown Well	10008000-03G (primary well)
Well #4 - Baby Carriage Brook	1008000-04G
Well #5	1008000-06G
Well #6	100800-07G (inactive)

The goal of this combined plan is to encourage the preservation of high quality drinking water for the Town of Amherst and to raise public awareness about watershed and wellhead protection. The first step in developing a protection plan is to identify areas of concern within the watershed. Impacts within these areas may negatively impact the quality of the source water and groundwater. The protection areas include the Zones A and B of surface water supplies and the Zones I and II of groundwater supplies. These zones, and the remaining watershed areas that contribute surface and groundwater to a water supply but lie beyond the limits of these protection areas are defined as follows:

Atkins Reservoir and Pelham Reservoir System

- Surface water supply intake
- All tributaries to the Atkins Reservoir and Pelham Reservoir System
- Zone A:

1. The land area between the surface water source and the upper boundary of the bank; and
 2. The land area within a 400-foot lateral distance from the upper boundary of the bank of a Class A surface water source, as defined in 314 CMR 4.05(3)(a); and
 3. The land area within a 200-foot lateral distance from the upper boundary of the bank of a tributary or associated surface water body.
- Zone B: the land area within one-half mile of the upper boundary of the bank of a Class A surface water source, as defined in 314 CMR 4.05(3)(a), or the edge of the watershed, whichever is less. However, Zone B shall always include the land area within a 400-foot lateral distance from the upper boundary of the bank of a Class A surface water source.
 - Zone C: the land area not designated as Zone A or Zone B within the watershed of a Class A surface water source, as defined in 314 CMR 4.05(3)(a). The Zone C of the Pelham Reservoir System is located primarily within the Town of Pelham and extends north into the Town of Shutesbury.

Lawrence Swamp Wells

- Zone I: A protective land area immediately adjacent to a well or wells and up to 400-feet in radius depending on the well's yield.
 - Zone I radii for all five wells is 400 feet.
- Zone II: The area that contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated (180 days of pumping at approved yield, with no recharge from precipitation). It is bounded by the groundwater divides that result from pumping the well and by the contact of the aquifer with less permeable materials such as till or bedrock. In some cases, streams or lakes may act as recharge boundaries. In all cases, Zone II shall extend upgradient to its point of intersection with prevailing hydrogeologic boundaries (a groundwater flow divide, a contact with till or bedrock, or a recharge boundary).
 - The majority of the Zone II for the Lawrence Swamp wells lies within Amherst and Belchertown. Small sections extend north into Pelham and south into Granby.

- Zone III: The land area beyond the area of the Zone II from which surface water and groundwater drain into Zone II. The surface drainage area as determined by topography is commonly coincident with the groundwater drainage area and is used to delineate Zone III.
 - The Zone III for the Lawrence Swamp wells extends into Amherst, Belchertown, Granby, and Pelham.

SECTION 2 WATER SUPPLY PROTECTION COMMITTEE Tighe & Bond

2.1 PURPOSE OF A WATER SUPPLY PROTECTION COMMITTEE

Establishing a Water Supply Protection Committee is the first step for generating support for local watershed protection. The Committee is charged with implementing identified action items for wellhead and watershed protection, reviewing consultant reports and proposed developments, assisting with local protection controls, and working with the watershed communities to protect shared resources. Municipal employees and officials, local civic and environmental organizations, and residents and business owners located within the Zones A, B, and C and Zones I, II, and III areas are encouraged to participate in the Committee and its meetings.

The Committee is responsible for making decisions regarding potential land development, regulatory controls, and land acquisition opportunities. The Committee is also responsible for the implementation of public outreach and education programs. The Committee will work with the Towns of Amherst, Belchertown, Leverett, Pelham, Shutesbury, and Granby to make diligent decisions regarding water supply protection.

2.2 MEMBERS OF THE WATER SUPPLY PROTECTION COMMITTEE

The Town of Amherst currently maintains an Aquifer Protection Committee that will serve as the Water Supply Protection Committee. The current members of the Committee are listed below:

- Chadwick Johnson
- Stephen Mabee (Chair)
- Michelle Mateo
- Ward Motts (Associate)
- W. Jesse Schwalbaum
- Lyons Witten
- Guilford Mooring (Staff Liaison)
- Robert Pariseau (Staff Liaison)

Maps relating to the Atkins Reservoir watershed, the Pelham Reservoir System watershed, and the Lawrence Swamp Wellhead Protection Area were generated using Massachusetts Geographic Information System (MassGIS), Town of Amherst and Belchertown data layers. In order to assess and prioritize possible threats to the public water source, information related to watershed characteristics, land uses, and topography were assembled on the maps provided in Appendix A.

- Map 1: Base Map – shows basic watershed characteristics
- Map 2: Land Uses – shows major land uses in the watershed
- Map 3: Protected/Restricted Open Space – shows open space areas under protection or conservation restrictions in the watershed
- Map 4: Zoning – shows local land zoning designations
- Map 5: Land Topography – shows USGS topographical information with surface water and/or groundwater supply protection zone overlays

Data layers indicate the most recently available information from MassGIS. The scope of this Plan does not include identifying and/or correcting inadequacies in MassGIS data. Therefore, the data layers are assumed to be accurate, as provided by MassGIS, and no changes were made to them. Some figures have additional text in order to assist with data interpretation. In addition, to the information obtained from available mapping sources, windshield surveys of each area were performed.

3.1 WATERSHED MAPPING - ATKINS RESERVOIR

The Atkins Reservoir watershed borders two other public water supply watersheds. The Metropolitan District Commission's Quabbin Reservoir watershed is located to the east and the Town of Amherst's Pelham Reservoir System watershed is located to the south.

3.1.1 Map 1: Base Map

Map 1 includes basic watershed characteristics including water bodies, streams, wetland areas, water supply locations, water supply protection Zones A, B, and C, groundwater protection Zone II, Interim Wellhead Protection Areas (IWPAs), major basins, sub basins, transportation routes, and transmission lines. The identification of watershed characteristics may help locate potential sources of contamination to the surface water. Not all types of basic features may exist within every watershed.

As shown on Map 1, the watershed of Atkins Reservoir lies within Amherst, Shutesbury, Leverett, and Pelham. The surface protection zones for the reservoir are described below:

- **Zone A:** This area, covering the Atkins Reservoir and its tributaries, is primarily within Shutesbury, but small portions extend into the communities of Leverett, Pelham and Amherst. The area extends approximately 18,000 feet to the east, 5,300 feet to the south, 5,800 feet to the north, and 400 feet to the west of the intake structure for Atkins Reservoir. This zone is depicted by a blue-hatched area.
- **Zone B:** The land area within one-half mile of the upper boundary of the bank of the surface water source, as defined in 314 CMR 4.05(3)(a), or the edge of the watershed, whichever is less. This zone lies within both Amherst and Shutesbury and is depicted by a yellow-hatched area.
- **Zone C:** Any area within the watershed that is not designated Zone A or B. This zone lies within the Towns of Shutesbury, Pelham and Leverett, and is depicted by a red-hatched area.

3.1.2 Map 2: Land Uses

In addition to the watershed information provided on Map 1, Map 2 shows major land uses that may affect the surface water supply sources. MassGIS has mapped several major land uses including non-forested wetlands, recreational, residential, commercial, industrial, urban, transportation, waste disposal, water bodies, wooded perennial area, solid waste sites, and underground storage tanks. Not all of these uses may exist in every watershed. The identification of land uses may assist in determining areas of the watershed most vulnerable to contamination.

Major land uses present within the watershed include several areas of low-density residential land concentrated along West Pelham Road in the eastern portion of the watershed. These areas exist within portions of Zones A, B, and C. There are also several areas of cropland as well as an industrial area at the easternmost end of the watershed within the Zone C.

3.1.3 Map 3: Protected/Restricted Open Space

Map 3 includes the watershed information provided on Map 1 as well as protected/restricted open space areas that may affect the surface water source. "Protected" open space that is identified on the MassGIS map includes lands that are listed as Chapter 61 (forestry), Chapter 61A (agricultural), Chapter 61B (recreation), Department of Conservation and Recreation (DCR), Metropolitan District Commission

(MDC), State, County, Municipal, Federal, public and private protections. Restricted open space includes conservation restrictions, agricultural preservation restrictions, and combined conservation and agricultural preservation restrictions (CR/APR). Not all types of open space may exist within every watershed.

It should be noted that not all open space land identified is permanently protected. The Chapter 61 program gives communities the "right of first refusal" to purchase Chapter 61 lands when they go up for sale. However, if a community does not have the means to acquire the property, it can be sold for development. Also, not all lands held by a government entity or land trust are permanently protected, unless so stated in the deed. These properties may be sold, swapped or otherwise developed.

There are some protected open space areas within the watershed in the Zone A tributary area and in the Zone C areas. The areas of the watershed within Leverett and Pelham are designated almost entirely as Chapter 61 (forestry). A small portion of Chapter 61B recreation land is located within the Zone C in Leverett. There is a parcel designated CR/APR land that is also designated "Private, Not Chapter 61"; this parcel overlays a Zone A tributary area and is located approximately 1,500 feet south of the southern end of Atkins Reservoir.

There are several parcels of municipal protected open space mapped in Shutesbury. MassGIS defines municipal protected open space as undeveloped parcels owned by a municipality. The parcels shown are all coincident with parcels owned by the Town of Amherst, but do not show all of the parcels actually owned by the Town of Amherst in Shutesbury. A complete listing and map of parcels owned by the Town of Amherst within the Atkins Reservoir watershed is provided in Appendix F.

3.1.4 Map 4: Zoning

Map 4 includes the watershed information provided on Map 1 and local land zoning designations. Zoning information illustrated on the MassGIS map includes residential, commercial, industrial, restricted, and other zoning uses.

Zoning for the watershed areas within the Towns of Amherst and Pelham is shown on Map 4. These areas of the watershed are zoned residential and are included within the watershed protection districts of each Town. Zoning information for Shutesbury and Leverett is not yet available from MassGIS and was not included on Map 4. The Towns of Leverett and Shutesbury have also not developed separate zoning maps that could be included with this protection plan. However, based on conversations with Town officials and a review of the Towns' bylaws, it was determined that all Atkins watershed lands within Shutesbury and Leverett are zoned residential. The text of the current zoning bylaws for the Towns of Amherst, Leverett, Shutesbury, and Pelham is

located in Appendix D. The watershed area within Leverett is also protected under the Leverett Aquifer Protection District.

3.1.5 Map 5: Land Topography

Map 5 shows a USGS map with the surface water and protection zone overlays. Topography includes 10-foot contour intervals that are helpful in determining runoff characteristics of the watershed, which will assist in determining the vulnerability of portions of the watershed area.

Determining the vulnerable areas requires, but is not limited to, evaluating land slopes, proximity of areas of concern to the reservoir, and travel paths of streams and tributaries. The topography on Map 5 shows that most of the watershed is comprised of moderate slopes. Steeply sloped areas are susceptible to erosion, which may lead to increased turbidity in the waters of the Atkins Reservoir. The Town of Amherst has not experienced turbidity problems in recent years with the Atkins Reservoir water supply.

3.2 WATERSHED MAPPING - PELHAM RESERVOIR SYSTEM

The Pelham Reservoir System watershed borders two other public water supply watersheds. The Metropolitan District Commission's Quabbin Reservoir watershed is located to the east and the Town of Amherst's Atkins Reservoir watershed is located to the north.

3.2.1 Map 1: Base Map

As shown on Map 1, the watershed of Pelham Reservoir System lies within Pelham, Shutesbury, and Belchertown. The surface protection zones for the reservoir are described below:

- **Zone A:** This area, covering the Pelham Reservoir System and its tributaries, is primarily within Pelham, but a small portion extends into the Town of Shutesbury. The area extends approximately 14,000 feet to the east, 4,600 feet to the south, 15,400 feet to the north, and 600 feet to the west of the intake structure for Pelham Reservoir System. This zone is depicted by a blue-hatched area.
- **Zone B:** The land area within one-half mile of the upper boundary of the bank of the surface water source, as defined in 314 CMR 4.05(3)(a), or the edge of the watershed, whichever is less. This zone lies entirely within Pelham and is depicted by a yellow-hatched area.

- Zone C: Any area within the watershed that is not designated Zone A or B. This zone lies within the Towns of Pelham and Shutesbury, and is depicted by a red-hatched area.

3.2.2 Map 2: Land Uses

The major land use in the watershed is forested. Other uses include several areas of low-density residential land concentrated along Amherst and Packardville Roads in the central and southern portions of the watershed. These areas exist within portions of Zones A, B, and C. There are also several areas of pasture and cropland, as well as a Western Massachusetts Electric Company (WMECO) transmission right-of-way within the watershed.

3.2.3 Map 3: Protected/Restricted Open Space

There are protected open space areas within the watershed in the Zone A tributary area and in the Zone B and C areas. The protected areas of the watershed within Pelham are designated almost entirely as "municipal." None of the watershed area located in Shutesbury is currently protected.

There are several parcels of "other state" protected open space mapped in Pelham. MassGIS defines municipal protected open space as parcels owned by a municipality. The parcels shown are all coincident with parcels owned by the Town of Amherst, but do not show all of the parcels actually owned by the Town of Amherst in Shutesbury. A complete listing and map of parcels owned by the Town of Amherst within the Atkins Reservoir watershed is provided in Appendix F.

3.2.4 Map 4: Zoning

Zoning for the watershed areas within the Towns of Pelham and Belchertown is shown on Map 4. These areas of the watershed are zoned residential and are included within the watershed protection districts of each Town. The Town of Shutesbury has not developed separate zoning maps that could be included with this protection plan. However, based on conversations with Town officials and a review of the Town's bylaws, it was determined that all Pelham Reservoir System watershed lands within Shutesbury are zoned residential. The text of the current zoning bylaws for the Towns of Pelham, Shutesbury, and Belchertown is located in Appendix D.

3.2.5 Map 5: Land Topography

Determining the vulnerable areas requires, but is not limited to, evaluating land slopes, proximity of areas of concern to the reservoir, and travel paths of streams and

tributaries. The topography on Map 5 shows that most of the watershed is comprised of moderate slopes. Steeply sloped areas are susceptible to erosion, which may lead to increased turbidity in the waters of the Pelham Reservoir System. The Town of Amherst has experienced turbidity problems in recent years with the Pelham Reservoir System water supply. Portions of the watershed consists of steep, flashy streams that contribute to temporary periods of turbidity. Relatively level or gently sloped areas along tributary stream courses within the watershed area are potentially susceptible to beaver activity such as the construction of dams. Historically, the Pelham Reservoir System watershed has experienced problems with local beaver populations.

3.3 WELLHEAD PROTECTION AREA - LAWRENCE SWAMP

The Lawrence Swamp Wellhead Protection Area does not share direct boundaries with other protected public water supply areas, as currently mapped by MADEP. The same Zone II boundary incorporates public water supply wells maintained by Belchertown. One of Belchertown's wells, with its IWPA, is mapped to the southeast of the aquifer.

3.3.1 Map 1: Base Map

As shown on Map 1, the wellhead protection area (incorporating the Zones I and II) of the Lawrence Swamp wells lies primarily within the Towns of Amherst and Belchertown, with small areas extending into Pelham and Granby. The protection zones for the aquifer are described as follows:

- Zone I: This land area is immediately adjacent to a well or wells and is up to 400 feet in radius depending on the yield of the well. The Zone I area for all Lawrence Swamp wells extends as a 400-foot radius surrounding each wellhead.
- Zone II: The land area that contributes water to a well as determined by topography and groundwater flow. The Zone II is the approved recharge area for wells that pump more than 100,000 gpd. In all cases, the Zone II shall extend upgradient to its point intersection with prevailing hydrogeologic boundaries. This zone lies within the Towns of Amherst, Belchertown, Pelham and Granby and is depicted by a pink-hatched area.
- Zone III: The land area beyond the area of the Zone II from which surface water and groundwater drain into the Zone II. The surface drainage area, as determined by topography, is commonly coincident with the groundwater drainage area and will be used to delineate the Zone III. The Zone III for the Lawrence Swamp wells extends into the Towns of Amherst, Belchertown, Granby, and Pelham.

3.3.2 Map 2: Land Uses

Major land uses that are present within the Zone II include several areas of low and medium density residential land concentrated along Bay Road to the south and between Route 9 and Station Road to the north as well as several areas in the eastern portion of the Zone II. There are also several areas of pasture, cropland, and orchards within the Zone II. There is an area of commercial land use along Route 9 in Belchertown as well as an area used for mining (i.e. gravel pit) near Route 9 in Belchertown.

The Norwottuck Rail Trail, Robert Frost Trail, and Metacomet-Monadnock Trail traverse the Zone II. The Norwottuck Rail Trail runs through the Zone II, close to Wells 1 and 2. The wells are protected from the public by a 6-foot chainlink fencing and locked access gates.

A utility easement owned and maintained by the WMECO with a north-south alignment is located within the Zone II wellhead protection area. As required by, and in accordance with, 333 CMR 11.00, *Rights-of-Way Vegetation Management Plan (VMP)* have been developed for the Northeast Utilities System/WMECO. The VMP includes provisions set forth in accordance with 333 CMR 11.00 regarding "sensitive areas". Sensitive areas are defined in 333 CMR 11.02 and include, but are not limited to the following:

- The primary recharge area of a public drinking water supply well
- The area within 400 feet of any surface water used as a public water supply
- The area within 100 feet of any standing or flowing water
- The area within 100 feet of any wetland

WMECO follows Best Management Practices for management of the ROW within these "sensitive" areas. These BMPs include:

- Use of Department of Agricultural Resources (DAR, formerly the Department of Food and Agriculture) and MADEP recommended herbicides for use in sensitive areas within rights-of-way. These herbicides are characterized by their low: toxicity, mobility, and persistence.
- Herbicides are applied in accordance with WMECO's VMP and *Yearly Operational Plan (YOP)*.
- Herbicide treatment is made only by applicators that are appropriately certified or licensed by the DAR.

- No foliar applications of herbicides are used to control vegetation greater than 12 feet in height.
- The DAR, Conservation Commission, Board of Health, and chief elected official of the municipality are notified by registered mail at least 21 days prior to any application.
- No more than 10% of the initially identified target vegetation on WMECO's ROW in any municipality is treated and the total amount of herbicide applied in any one year does not exceed the limits specified by the label or YOP.
- A minimum of 24 months will elapse between herbicide applications in limited herbicide treatment zones of public groundwater supplies, public surface water supplies, and private drinking water supplies.
- A minimum of 12 months will elapse between herbicide applications in limited herbicide treatment zones of surface waters, wetlands, and habitated and agricultural areas.
- All other limitations placed on sensitive areas will be followed as provided by 333 CMR 11.04.

3.3.3 Map 3: Protected/Restricted Open Space

There are protected open space areas within the Zone II. The majority of the protected open space within the Zone II is municipal. MassGIS defines municipal protected open space as parcels owned by a municipality. The parcels shown are all coincident with parcels owned by the Town of Amherst. A complete listing and map of parcels owned by the Town of Amherst within the Lawrence Swamp Wellhead Protection Area is provided in Appendix F.

There are several parcels of "private, not Chapter 61" and APR protected open space mapped in the Towns of Amherst and Belchertown.

3.3.4 Map 4: Zoning

Zoning for the Zone II area within the Towns of Amherst, Belchertown, Pelham and Granby is shown on Map 4. The majority of the Zone II is zoned residential. However, the area surrounding the wells in Amherst is zoned "restricted" per Conservation Restrictions (CRs). Minor commercial and industrial inclusions are located along Route 9 in Amherst and Belchertown. The text of the current zoning bylaws for the Towns of Amherst, Belchertown, Pelham and Granby is located in Appendix D. MADEP has reviewed the bylaws governing wellhead protection for the

Towns of Amherst and Belchertown and, in a letter dated March 24, 2003, stated that the Amherst Water Department "is in compliance with the MA Wellhead Protection Regulations and requirements." This letter is included in Appendix D.

3.3.5 Map 5: Land Topography

Map 5 shows a USGS map with the Zone II protection area overlay. Topography includes 10-foot contour intervals that are helpful in determining runoff characteristics of the Zone II, which assists in determining the vulnerability of portions of the Zone II area.

Determining the vulnerable areas requires, but is not limited to, evaluating land slopes, proximity of areas of concern to the water supply wells, and travel paths of streams and tributaries. The topography on Map 5 shows that the recharge area is comprised of topographically level areas as well as moderate to steep slopes.

Land uses within public water supply watershed areas may have serious impacts on water quality. Windshield surveys of the watershed and wellhead recharge areas were conducted in order to determine the land use activities that currently exist. A detailed discussion of these surveys is presented in the following sections.

4.1 ATKINS RESERVOIR WATERSHED INVENTORY

4.1.1 Impacts and Problems

This section involves identifying and prioritizing private and public land use activities that may impact the Atkins Reservoir. A windshield survey was conducted in order to determine the land use activities that currently exist within the watershed. A list of potential contamination sources that may exist within the watershed protection areas was utilized in order to identify potentially adverse impacts on the Atkins Reservoir. This list was based on the SWAP Land Use Pollution Potential Matrix for surface water sources and is provided in Appendix C. Recommendations for further mitigation of these impacts to the Atkins Reservoir watershed are listed in Section 5 of this document.

4.1.1.1 Impacts from Existing Land Use

Existing and future land use activities that may have an impact on the surface water supply sources include: on-site septic systems; public and private recreational activities; municipal uses and facilities; untreated stormwater runoff; public and private forestry practices; uncontained storage of fertilizers, manure, or road sand/salt; domestic animals; new construction; sand and gravel excavations; spills along roads and railroads and at commercial and industrial facilities; aboveground and underground storage tanks; erosion; un-permitted and unauthorized activities; waste disposal areas; use, storage, and disposal of hazardous materials; and non-sanitary wastewater.

The following potential contamination sources were discovered in the Atkins Reservoir watershed.

- There are approximately 3½ miles of electrical transmission line rights-of-way in the Atkins Reservoir watershed, primarily located in Zone C, but crossing several areas of Zone A. Rights-of-Way are considered high risk threats to the watershed, due to the activities associated with their upkeep. WMECO owns the transmission lines, and is required to provide the Towns of Shutesbury, Leverett and Pelham with an annual operational plan. This plan details what activities the utility plans to undertake to maintain those rights-of-way. The DPW should review the Town's copy of this plan, available through the

Conservation Commission, so that they may suggest changes that will enhance water supply protection.

- There are 163 residences within the Atkins Reservoir watershed that rely on sub-surface sewage disposal systems. Of these 163 residential parcels, 45 parcels are within Zone A, 22 parcels are within Zone B and 96 are located within Zone C. The Town of Amherst does have a municipal sewer system, but service is not available to the residences within the Amherst portion of the watershed. The presence of microbial contaminants from septic systems may contribute to source water contamination; thus septic systems are classified as a medium-level threat. In addition, residences in general pose a medium risk threat the water supply due to the potential for improper handling or storage of products such as paints, cleaning products, fertilizers, pesticides, and home heating fuels.
- WMECO has an electric substation on Pratt Corner Road in Shutesbury, which is located within Zone C. The substation is just over one-half mile from Atkins Reservoir. The transformers at the substation were replaced within the past few years to eliminate the potential for PCB contamination at the site. At that time, the site was also remediated to remove any existing PCB contamination. Utility transformer substations are classified as a medium risk threat due to the potential for spills, leaks, or improper handling of chemicals or other materials.
- New England Electric Services Communication (NEESCom), a subsidiary of National Grid USA, operates a fiber optic communication building just north of the WMECO substation site. The building site includes an exterior generator and 1,000-gallon diesel fuel storage tank. The tank is constructed of double-walled steel and encased in a concrete vault. Aboveground storage tanks are classified as medium risk threats to the water supply due to the potential for spills, leaks, or improper handling of the materials contained.
- The WD Cows Lumber Company has extensive land holdings throughout the Atkins Reservoir watershed. Forestry operations pose a medium risk threat to the source water supply due to the potential for spills, leaks, or improper handling of herbicides, pesticides, or equipment maintenance materials. Also, there is the potential for induced erosion and possible silt runoff into the tributary brooks and/or the reservoir itself.
- There is one paved road within the watershed and several unpaved roadways. All of these roads are lightly traveled, and primarily serve the residences within the watershed. Unpaved roads may be susceptible to erosion during storm events, especially Pratt Corner Road, Sand Hill Road, and Cushman Road, which run through several portions of Zone A. West Pelham Road, the only

paved road in the watershed, poses a potential threat to the watershed due to maintenance and deicing chemicals that may be used there. Transportation of hazardous chemicals, most likely home heating fuels, may also occur on these roads. However, the occurrence frequency is probably low due to the lack of development in the area and the nature of the routes.

- There are stormwater drains within the watershed. Stormwater drains are considered low risk threats, though they may be sources of debris, pet waste, and chemicals in stormwater from roads and lawns.
- There is a cemetery located on Pratt Corner Road in Shutesbury. It is located on a parcel owned by the Town of Shutesbury within Zone C. Cemeteries are identified as low risk threats to the water supply, due to the potential for spills, leaks, or improper handling of pesticides and fertilizers on the grounds and historic use of embalming fluids.

According to the Bureau of Waste Site Cleanup (BWSC), as of December 20, 2004, there have not been any known occurrences of spills along roadways or at facilities, within any portion of the Atkins Reservoir watershed. BWSC can be contacted via the Internet at www.state.ma.us/dep.

4.1.1.2 Impacts from Future Land Uses

In order to determine which future land uses may impact a water supply, current zoning with respect to watershed protection was reviewed. Town zoning maps and bylaws govern which future land uses and activities will be permitted. Therefore, it is important to prohibit or control the development of land within Zones A, B, and C that could negatively affect the source water.

The entire watershed is zoned residential. The Towns of Amherst, Leverett, and Pelham have adopted bylaws and watershed protection districts to protect lands within the Atkins Reservoir watershed. The Town of Shutesbury currently has limited protection measures in place for the Atkins Reservoir. Shutesbury's current bylaw protects 12 parcels owned by the Town of Amherst that are in close proximity to the reservoir. The bylaw describes activities that are prohibited on these parcels, and the penalties that will be assessed to those in violation. The Town of Amherst intends to work with the Town of Shutesbury to implement a more comprehensive bylaw; these efforts are described in Section 4.3. The text of the Towns' current bylaws is located in Appendix D.

4.1.1.3 Public Access and Recreation Control

Public access and recreation may impact source water quality. Some problems may include erosion, trash, vehicular and pedestrian traffic, parking, unauthorized swimming and other activities, restrooms, and waste from domestic animals. The following was discovered with regard to public use and recreation in the Atkins Reservoir watershed:

- There are no permitted recreational uses for the Atkins Reservoir.
- Most of the residences within the watershed lie along Pratt Corner Road, Sand Hill Road or Cushman Road in Shutesbury. The roads are unpaved and erosion occurs during rain events. Cushman Road borders the reservoir from the Amherst line east to Pratt Corner Road. Cushman Road lies mostly within Zone A, and passes through the point where water is diverted from Dean Brook into Nurse Brook for the Atkins Reservoir. Pratt Corner Road continues northeast from the intersection of Cushman Road. Pratt Corner Road lies mostly within Zone C, but crosses several tributaries, which means some sections of the road are in Zone A. Sand Hill Road connects to Pratt Corner Road about ½-mile northeast of Cushman Road, and continues east to West Pelham Road. Sand Hill Road lies in Zone C and crosses several areas of Zone A.
- No established recreational areas were found anywhere within the watershed, but trash and other evidence of human activity was observed sporadically in the watershed. No evidence of, and the Town has not reported any, recreational activities that may impact water quality; such as ATV or horse riding activities.

However, both the Robert Frost Trail (RFT) and the Metacomet-Monadnock Trail (M&M) traverse the Atkins Reservoir Watershed. The RFT and M&M are foot and mountain-bike trails marked with blazes. Approximately 0.6 miles of the RFT lies within Zones A and B and approximately 1.46 miles of the M&M lies within Zones A, B and C. A recent survey of these trails did not reveal signs of vandalism or misuse of the area.

4.1.1.4 Wildlife Impacts

Wild animals, farm animals, and domestic pets can be carriers of waterborne diseases such as *Giardia*, *Cryptosporidium*, and *Salmonella*. It is important to monitor wildlife in order to determine the extent of contact with the reservoir. Animal populations to monitor for include but are not limited to gulls, geese, and other birds, dogs, horses, beaver, muskrat, and deer.

The Town of Amherst has cited beaver activity as a continuing area of concern along both the Dean and Nurse Brook tributaries, although beaver activity has been more

problematic in the Pelham Reservoir System. No specific locations of beaver activity have been identified within the Atkins Reservoir watershed, but beavers have been a recurring problem that requires continued monitoring. No other potential wildlife impacts have been detected in the watershed.

4.1.1.5 In-Lake Problems

The Town of Amherst has not experienced any historical in-lake problems related to algae, aquatic vegetation, or bacteria in the Atkins Reservoir. The Town of Amherst currently conducts monthly source water sampling, as described in Section 3.2. Section 3.1.1 identified that the watershed is not subject to any immediate threats to water quality, therefore a more detailed in-lake water sampling, analysis, and monitoring program is not warranted unless results from the source water monitoring program show a decline in water quality. Current sampling for total and fecal coliform bacteria and turbidity provides a reasonable means of tracking water quality and identifying trends that may warrant a more detailed analysis in the future.

4.2 PELHAM RESERVOIR SYSTEM WATERSHED INVENTORY

4.2.1 Impacts and Problems

This section involves identifying and prioritizing private and public land use activities that may impact the Pelham Reservoir System. A windshield survey was conducted in order to determine the land use activities that currently exist within the watershed. A list of potential contamination sources that may exist within the watershed protection areas was utilized in order to identify potentially adverse impacts on the Pelham Reservoir System. This list was based on the SWAP Land Use Pollution Potential Matrix for surface water sources and is provided in Appendix C. Recommendations for further mitigation of these impacts to the Pelham Reservoir System watershed are listed in Section 5 of this document.

4.2.1.1 Impacts from Existing Land Uses

Existing and future land use activities that may have an impact on the surface water supply sources include: on-site septic systems; public and private recreational activities; municipal uses and facilities; untreated stormwater runoff; public and private forestry practices; uncontained storage of fertilizers, manure, or road sand/salt; domestic animals; new construction; sand and gravel excavations; spills along roads and railroads and at commercial and industrial facilities; aboveground and underground storage tanks; erosion; un-permitted and unauthorized activities; waste disposal areas; use, storage, and disposal of hazardous materials; and non-sanitary wastewater.

The following potential contamination sources were discovered in the Pelham Reservoir System watershed.

- There are approximately 3 miles of electrical transmission line rights-of-way in the Pelham Reservoir System watershed, located entirely within the Zone C. Rights-of-Way are considered high risk threats to the watershed, due to the activities associated with their upkeep. WMECO owns the transmission lines, and is required to provide the Towns of Pelham, Shutesbury, and Belchertown with an annual operational plan. This plan details what activities the utility plans to undertake to maintain those rights-of-way. As described in Section 3.2.2, WMECO follows Best Management Practices for right-of-way maintenance in accordance with 333 CMR 11.00. A copy of this plan is provided in Appendix C.
- There are 54 residences within the Pelham Reservoir System watershed that rely on sub-surface sewage disposal systems. Of these 54 residential parcels, one (1) is located within Zone A, 24 parcels are within Zone B and 29 are located within Zone C. The presence of microbial contaminants from septic systems may contribute to source water contamination; thus septic systems are classified as a medium-level threat. In addition, residences in general pose a medium risk threat to the water supply due to the potential for improper handling or storage of products such as paints, cleaning products, fertilizers, pesticides, and home heating fuels.
- The WD Cows Lumber Company has extensive land holdings throughout the Pelham Reservoir System watershed. Forestry operations pose a medium risk threat to the source water supply due to the potential for spills, leaks, or improper handling of herbicides, pesticides, or equipment maintenance materials. Also, there is the potential for induced erosion and possible silt runoff into the tributary brooks and/or the reservoir itself. At this time, there are no known plans to change ownership or land use of these forestry lands.
- There are paved and unpaved roadways within the watershed. All of these roads are lightly traveled, with the exception of Amherst Road, which is a primary east-west travel corridor through the Town of Pelham, and primarily serve the residences within the watershed. Unpaved roads may be susceptible to erosion during storm events. Paved roads may pose a potential threat to the watershed due to maintenance and deicing chemicals that may be applied. Transportation of hazardous chemicals, most likely home heating fuels, may also occur on these roads. However, the occurrence frequency of trips is probably low due to the lack of development in the area and the nature of the routes.

The Town of Pelham Highway Department conducts annual street sweeping and catchbasin cleaning activities in the spring.

Additionally, the Town of Pelham is proposing a water quality basin to improve stormwater runoff from catchbasins to Harris Brook as part of roadway improvements to Amherst Road. Currently, untreated stormwater is discharged to Harris Brook. Construction is anticipated to begin in 2006.

- There are stormwater drains within the watershed. Stormwater drains are considered low risk threats, though they may be sources of debris, pet waste, and chemicals in stormwater from roads and lawns.
- There is a cemetery located on Route 202 in Pelham within Zone C. Cemeteries are identified as low risk threats to the water supply, due to the potential for spills, leaks, or improper handling of pesticides and fertilizers on the grounds and use of embalming fluids.
- According to BWSC, as of March 26, 2004, there have not been any known occurrences of spills along roadways or at facilities, within any portion of the Pelham Reservoir System watershed. BWSC can be contacted via the Internet at www.state.ma.us/dep.

4.2.1.2 Impacts from Future Land Uses

In order to determine which future land uses may impact a water supply, current zoning with respect to watershed protection was reviewed. Town zoning maps and bylaws govern which future land uses and activities will be permitted. Therefore, it is important to prohibit or control the development of land within Zones A, B, and C that could negatively affect the source water.

The entire watershed is zoned residential. The Towns of Pelham and Belchertown have adopted bylaws and watershed protection districts to protect lands within the Pelham Reservoir System watershed. The Town of Shutesbury currently has limited protection measures in place for the Pelham Reservoir System. Shutesbury's current bylaw protects 12 parcels owned by the Town of Amherst that are in close proximity to the reservoir. The bylaw describes activities that are prohibited on these parcels, and the penalties that will be assessed to those in violation. The Town of Amherst intends to work with the Town of Shutesbury to implement a more comprehensive bylaw; these efforts are described in Section 4.3. The text of the Towns' current bylaws is located in Appendix D.

4.2.1.3 Public Access and Recreation Impacts

Public access and recreation may impact source water quality. Some problems may include erosion, trash, vehicular and pedestrian traffic, parking, unauthorized swimming and other activities, restrooms, and waste from domestic animals. The following was discovered with regard to public use and recreation in the Pelham Reservoir System watershed:

- With the exception of the Metacomet & Monadnock Trail (M&M), there are no permitted recreational uses for the Pelham Reservoir System.
- Most of the residences within the watershed lie along Amherst and Packardville Roads in Pelham. Amherst Road borders the Hawley Reservoir along its northern bank. Portions of Amherst Road lie within Zones A and B. The majority of Amherst Road lies within Zone C. Gates Road, which crosses Harris Brook upstream from the intake structure, is located within Zones A and B. The road is unpaved and erosion occurs during rain events.
- No established recreational areas were found anywhere within the watershed, but trash and other evidence of human activity was observed sporadically in the watershed. No evidence was observed of, and the Town has not reported any recreational activities that may impact water quality, such as ATV or horse riding activities.

However, sections of the M&M traverse the Pelham Reservoir System Watershed. Approximately 2.11 miles of the M&M lies within Zones A, B and C. This trail is for hiking and mountain biking. A recent survey of these trails did not reveal signs of vandalism or misuse of the area.

4.2.1.4 Wildlife Impacts

Wild animals, farm animals, and domestic pets can be carriers of waterborne diseases such as *Giardia*, *Cryptosporidium*, and *Salmonella*. It is important to monitor wildlife in order to determine the extent of contact with the reservoir. Animal populations to monitor for include but are not limited to gulls, geese, and other birds, dogs, horses, beaver, muskrat, and deer.

Historically, beaver activity has been problematic in the Pelham Reservoir System. Specific locations of beaver activity identified within the Pelham Reservoir System watershed include Brewer Swamp and Harris Brook. No other potential wildlife impacts have been detected in the watershed.

4.2.1.5 In-Lake Problems

The Town of Amherst has experienced historical in-lake problems related to bacteria and wildlife impacts in the Pelham Reservoir System. The Town of Amherst currently conducts monthly source water sampling, as described in Section 4.3. Section 4.2.1.1 identified that the watershed is not subject to any immediate threats to water quality, therefore a more detailed in-lake water sampling, analysis, and monitoring program is not warranted unless results from the source water monitoring program show a decline in water quality. Current sampling for total and fecal coliform bacteria and turbidity provides a reasonable means of tracking water quality and identifying trends that may warrant a more detailed analysis in the future.

4.3 SAMPLING PLAN

The Town of Amherst currently has sampling programs in place for the Atkins Reservoir and the Pelham Reservoir System watersheds, treatment plants and distribution systems. These programs are described in the following sections.

4.3.1 Atkins Reservoir Watershed

The Town of Amherst currently has a sampling program in place for the Atkins Reservoir watershed, treatment plant and distribution system. Table 4.3.1-1 illustrates the Town's sampling program relevant to the Atkins Reservoir water supply. The program includes sampling from three locations within the watershed. Samples are collected from the Nurse and Dean Brook tributaries upstream from the diversion structure. Raw water samples are collected at the intake structure on the reservoir.

Water quality degradation due to wildlife activity has not been observed in the Atkins Reservoir watershed. The Town is currently addressing the presence of beavers in the Pelham Reservoir System watershed, but has not observed water quality problems associated with beaver activity within the Atkins Reservoir watershed. The current sampling program includes monthly watershed monitoring for total and fecal coliform bacteria and color and should provide the data necessary to determine if wildlife activities are affecting the Atkins Reservoir water quality.

Table 4.3.1-1
Current Sampling Plan- Atkins Reservoir Water Supply

<u>Parameter</u>	<u>Location</u>	<u>Type of Sample</u>	<u>Frequency</u>
Free and Total Chlorine	25 Distribution Sites	Distribution System	Twice Monthly
Total Coliform	25 Distribution Sites	Distribution System	Twice Monthly
Turbidity	Atkins WTP	Raw, Filter Effluent & Finished Water	Daily (continuous)
pH	Atkins WTP	Raw & Finished Water	Daily (continuous)
Color	Atkins WTP	Raw & Finished Water	Weekly
Free & Total Chlorine	Atkins WTP	Finished Water	Daily
Fluoride	Atkins WTP	Finished Water	Daily (continuous)
Fecal & Total Coliform Bacteria	3 Watershed Areas	Raw Water	Monthly
Color	3 Watershed Areas	Raw Water	Monthly

The regular sampling plan data should be routinely monitored to identify trends and the sampling plan should be re-evaluated periodically to determine possible modifications and to assure cost-effectiveness. Future consideration may be given to modifying the sampling plan to include algae, phytoplankton, total organic carbon, and dissolved organic carbon. The sampling plan could also be expanded to include additional tributaries to further isolate areas of contamination.

4.3.2 Pelham Reservoir System Watershed

The Town of Amherst currently has a sampling program in place for the Pelham Reservoir System watershed, treatment plant and distribution system. Table 4.3.2-1 illustrates the Town's sampling program relevant to the Pelham Reservoirs. The program includes sampling from five locations within the watershed. Samples are collected from the Dunlap and Amethyst Brooks as well as three (3) tributaries upstream from Hawley Reservoir.

The Town is currently addressing the presence of beavers in the Pelham Reservoir System watershed. The current sampling program includes monthly watershed monitoring for total and fecal coliform bacteria and color and should provide the data necessary to determine if wildlife activities are affecting the Pelham Reservoir System water quality.

Table 4.3.2-1
Current Sampling Plan- Pelham Reservoir System Water Supply

<u>Parameter</u>	<u>Location</u>	<u>Type of Sample</u>	<u>Frequency</u>
Free and Total Chlorine	25 Distribution Sites	Distribution System	Twice Monthly
Total Coliform	25 Distribution Sites	Distribution System	Twice Monthly
Turbidity	Centennial WTP	Raw, Filter Effluents & Finished Water	Daily (continuous)
pH	Centennial WTP	Raw & Finished Water	Daily (continuous)
Color	Centennial WTP	Raw & Finished Water	Weekly
Free & Total Chlorine	Centennial WTP	Finished Water	Daily (continuous)
Fluoride	Centennial WTP	Finished Water	Daily
Fecal & Total Coliform Bacteria	5 Watershed Areas	Raw Water	Monthly
Color	5 Watershed Areas	Raw Water	Monthly
Turbidity	5 Watershed Areas	Raw Water	Monthly

The regular sampling plan data should be routinely monitored to identify trends and the sampling plan should be re-evaluated periodically to determine possible modifications and to assure cost-effectiveness. Future consideration may be given to modifying the sampling plan to include algae, phytoplankton, total organic carbon, and dissolved organic carbon. The sampling plan could also be expanded to include additional tributaries to further isolate areas of contamination.

4.4 LAWRENCE SWAMP WELLHEAD PROTECTION AREA INVENTORY

4.4.1 Impacts and Problems

This section involves identifying and prioritizing private and public land use activities that may impact the Lawrence Swamp Wellhead Protection Area. A windshield survey was conducted in order to determine the land use activities that currently exist within the watershed. A list of potential contamination sources that may exist within the watershed protection areas was utilized in order to identify potentially adverse impacts on the Lawrence Swamp Wellhead Protection Area. This list was based on the Source Water Assessment & Protection Program (SWAP) Land Use Pollution Potential Matrix for surface water sources and is provided in Appendix C. Recommendations for further mitigation of these impacts to the Lawrence Swamp Wellhead Protection Area are listed in Section 5 of this document.

4.4.1.1 Impacts from Existing Land Use

Existing and future land use activities that may have an impact on the groundwater supply sources include: on-site septic systems; public and private recreational activities; municipal uses and facilities; untreated stormwater runoff; public and private forestry practices; uncontained storage of fertilizers, manure, or road sand/salt; domestic animals; new construction; sand and gravel excavations; spills along roads and railroads and at commercial and industrial facilities; aboveground and underground storage tanks; erosion; un-permitted and unauthorized activities; waste disposal areas; use, storage, and disposal of hazardous materials; and non-sanitary wastewater.

Identifying potential contamination source (PCS) locations assists in identifying existing and future threats within the water supply protection area. Knowing where the primary areas of concern are provides reliable justification for local protection controls; strengthens public awareness, education, and outreach efforts; and encourages community participation into protection efforts.

Potential threats to the water supply were classified using the MADEP SWAP land use pollution potential matrix guidelines for ground water sources, as presented in Appendix C. During a windshield survey of the Zone II area, the following PCS locations were identified:

- There are approximately 2.9 miles of electrical transmission line rights-of-way in the Zone II area of the Lawrence Swamp Wellhead Protection Area. Transmission Line Rights-of-Way are considered low risk threats to groundwater supplies, due to construction or corridor maintenance, and potential for over-application or improper handling of pesticides. WMECO owns the transmission lines, and is required to provide the Towns of Amherst and Belchertown with an annual operation plan. This plan details what activities the utility plans to undertake to maintain those rights-of-way. The Amherst Water Department should review this plan upon receipt so that they may suggest changes that will enhance water supply protection.
- An active railroad Right-of-Way runs through the entire Zone II area of the Lawrence Swamp Wellhead Protection Area and transects the Zone I of Wells 1 and 2. Rail corridors are considered high risk threats to groundwater supplies due to potential overapplication or mishandling of pesticides during Right-of-Way maintenance activities and leaks or spills resulting from fuel storage, transported chemicals and/or maintenance chemicals.
- Of the 837 residences within the Zone II area of the Lawrence Swamp Wellhead Protection Area, 478 residences rely on subsurface sewage disposal systems. The Town of Amherst does have a municipal sewer system and there have been recent discussions of extending municipal sewer service along Wildflower

Drive, Harkness Road and Hulst Road within the Lawrence Swamp Wellhead Protection Area.

Fuel oil storage at residential properties is considered a moderate threat to groundwater supplies. Spills or leaks resulting from improper handling may result in an impact to water quality.

Residential lawn care and gardening activities are considered moderate threats to groundwater supplies due to the potential improper use and/or storage and disposal of pesticides.

- There are paved and unpaved roads within the watershed. All of these roads are primarily used by passenger vehicles accessing residences within the watershed. Paved roads pose a potential medium risk threat to the watershed due to maintenance and deicing chemicals that may be used there. Transportation of hazardous materials, most likely home heating fuels, may also occur on these roads. However, the occurrence frequency is probably low in due to the lack of development in the area and the nature of the routes.
- There are stormwater drains and retention basins within the Zone II area of the Lawrence Swamp Wellhead Protection Area. These are considered low risk threats to groundwater supplies but may be sources of pet waste and chemicals in stormwater from roads, parking lots, and lawns.
- The Dwight Cemetery is located on Amherst Road (Route 9) in Belchertown within the Zone II area of the Lawrence Swamp Wellhead Protection Area. Cemeteries are identified as medium risk threats to the water supply, due to the potential for spills, leaks, or improper handling of pesticides and fertilizers on the grounds and use of embalming fluids.
- The Town's closed Municipal Solid Waste landfill is located directly to the north of the Zone II area of the Lawrence Swamp Wellhead Protection Area. The Town monitors several wells within the vicinity of the landfill, and as described below, has recently installed two (2) monitoring wells within the aquifer. These monitoring wells are located off Woodlot Road and Wildflower Drive.
- There is a fuel oil distributor located within the Zone II of the Lawrence Swamp Wellhead Protection Area. Fuel oil distributors are considered high risk threats to groundwater supplies due to the potential for spills, leaks, or improper handling or storage.

- Gas stations and automotive repair shops are considered high risk threats to groundwater supplies due to spills, leaks, or improper handling and storage of automotive fluids and fuels. There is one gas station/service station located within the Zone II of the Lawrence Swamp Wellhead Protection Area.
- There are multiple agricultural activities located within the Zone II of the Lawrence Swamp Wellhead Protection Area. These include forestry lands, dairy farms, livestock operations and nurseries. These are considered moderate to high risk threats to groundwater supplies due to the improper handling, storage and/or use of manure, fertilizers, and pesticides.
- There is one earth mining operation located within the Zone II of the Lawrence Swamp Wellhead Protection Area. Mining operations are considered moderate risk threats to groundwater supplies due to the use of heavy equipment, fuel storage and the potential for illegal dumping.

4.4.1.2 Impacts from Future Land Uses

In order to determine which future uses may impact the groundwater supply, current zoning with respect to groundwater supply protection was reviewed. Town zoning maps and bylaws govern which future land uses and activities will be permitted. Therefore, it is important to prohibit or control the development of land within Zones I and II that could negatively affect the groundwater.

The majority of the Zone II is zoned residential. A small portion along the northern edge near Route 9 is zoned industrial. Another portion along Route 9 is zoned commercial. The Towns of Amherst, Belchertown, Granby and Pelham have adopted bylaws and watershed protection districts to protect lands within the Lawrence Swamp Wellhead Protection Area. The text of the 'Towns' current bylaws is located in Appendix D and summarized below.

- Amherst: Watershed District Bylaw and Aquifer Protection Bylaw are in place and protect watershed and wellhead protection areas within the Town of Amherst. Amherst also has adopted a non-zoning floor drain regulation.
- Belchertown: Aquifer Protection District Zoning Bylaw is in place and includes all Zone II areas within the town, including the Zone II of the Lawrence Swamp Wellhead Protection Area. The Belchertown Board of Health has also adopted a non-zoning floor drain regulation.
- Pelham: Water Supply Protection District Bylaw is in place and covers the entire town, including the Zone II of the Lawrence Swamp Wellhead Protection Area. The Pelham Board of Health has not adopted floor drain regulations.

- Granby: Water Supply Protection District overlay zone is in place. However, the mapping does not include the small portion of the town that is within the Zone II of the Lawrence Swamp Wellhead Protection Area. The Granby Board of Health has not adopted floor drain regulations.

In late 2005, the Town of Amherst began discussing potential future uses of the former municipal landfill located off Route 9, and within the Lawrence Swamp Wellhead Protection Area. Potential future uses include a new DPW facility, municipal transfer station, and athletic fields.

4.4.1.3 Public Access and Recreation Control

Public access and recreation may impact groundwater quality. Some problems may include erosion, trash, vehicular and pedestrian traffic, parking and unauthorized activities. The following was discovered with regard to public use and recreation within the Lawrence Swamp Wellhead Protection Area:

- The Norwottuck Rail Trail, a public multi-use path, runs along an abandoned rail bed. This trail is in close proximity to supply Wells #1 and #2. Currently, a 6-foot chainlink fence and locked access gates discourages public access to the wells.
- Approximately 6.25 miles of the Robert Frost Trail (RFT) traverses the Zone II in a north-south orientation. Approximately 1.3 miles of this trail runs east-west through Lawrence Swamp proper. This trail is used for hiking, mountain biking and horseback riding.

Approximately 0.71 miles of the M&M traverses the southeast area of the Zone II in Belchertown near Holland Glen. This trail segment is in a north-south orientation.

A recent survey of these trails did not reveal signs of vandalism or misuse of the area.

- Most of the residences within the Zone II lie along Station Road, Bay Road, Warren Wright Road, Gooddell Road, Federal Street and Southeast Street.

4.4.1.4 Wildlife Impacts

Wildlife does not pose a serious threat to groundwater sources as it does to surface water sources. However, beaver activity may flood wellheads and excessive animal activity may result in impacts to groundwater supplies. While there is beaver activity

within the area, there are no known beaver issues affecting the wells in the Lawrence Swamp Wellhead Protection Area.

There are two horse farms located along Station Road within the limits of the Zone II. These farms should utilize BMPs to protect the water supply resource.

4.5 LAWRENCE SWAMP WELLHEAD PROTECTION AREA MONITORING

The Town of Amherst has several monitoring wells within the aquifer. As part of the water supply grant that funded this project, two new monitoring wells (1-03 and 2-03) were installed on September 15, 2003 within the Zone II area between the Town's public water supply wells and the closed landfill. The Town will use these monitoring wells to identify if the closed landfill located directly to the north of the aquifer has any impact on the aquifer. The wells were located such that any impact to the aquifer should be identified before the water supply wells are impacted.

SECTION 6 PUBLIC EDUCATION AND

COORDINATION

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Education involves assessing the water supply related educational needs within the watershed and recharge area and developing programs to address those needs. The Town of Amherst has two surface water and five groundwater supply sources. Educational initiatives the Town implements would involve all sources of drinking water.

Public education is an important communication and outreach tool for any water system, but even more so for the Town of Amherst due to its transient population. The Town has three colleges within its Town boundaries (University of Massachusetts at Amherst, Amherst College, and Hampshire College), and thus college students comprise a significant percentage of the Town's population. Even though the Town has been very proactive in developing educational programs for the school system and for the public, educational programs must be updated frequently to accommodate the ever-changing population in the Town. It is recommended that the Town of Amherst make parts of this protection plan available in electronic form on the Town of Amherst website. This would be a simple and cost effective way to raise awareness among consumers and residents within the watershed.

The Town has conducted a water conservation survey with the three colleges in the Town. The survey involved examination of the faucet aerators and shower facilities in all of the buildings, meeting with college/university officials to discuss necessary improvements, and implementing these improvements. All three of the colleges have implemented many of the water saving measures and total consumption at all three colleges has decreased significantly. The Town has adopted a water use restriction ordinance for periods of drought. Appendix I includes a copy of the Town of Amherst Water Use Restriction Ordinance, which is consistent with the MADEP model.

The Town of Amherst has also developed educational programs for its residents dealing with water quality, the importance of watershed protection, and water conservation. Working in conjunction with the Hitchcock Center for the Environment, the Town has developed classroom presentations on water conservation (Grades 2-5) and a water quality unit, during which Grade 4 students board the Hitchcock Center's "Ecobus" and conduct simple water quality tests at the Atkins Reservoir.

Through this grant, the Hitchcock Center developed and implemented groundwater education curricula for Grades 4 and 6. The Town must maintain a consistent educational awareness program for the users of its system. The Town of Amherst has also identified the need to expand its current programs. The Town continues to seek funding to pursue the following initiatives for education and protection of its water supply sources.

- Conducting an Additional Hazardous Waste Collection Day: Amherst currently conducts two collection days per year for hazardous wastes, typically at the end of April and October. The Town is hoping to expand this existing program by adding a third day. Expansion of this program will require additional training of existing Town staff. The Towns of Leverett, Pelham and Shutesbury participate in the Amherst collections, and an expansion of this program would enhance the protection of water supply protection areas.
- Updating and posting "No Trespassing" signs on parcels owned by the Town of Amherst to restrict access to the recharge area (Zone II) of the Lawrence Swamp well.
- Continued partnering with the Hitchcock Center for the Environment: The Town of Amherst intends to expand its existing relationship with the Hitchcock Center to develop an enhanced elementary and secondary education program in the school system.
- Both Hampshire College and the University of Massachusetts have programs whose curriculum is concerned with environmental conservation. The students and staff may be willing to volunteer their time and expertise in the development of educational programs.
- Publishing articles in the local newspaper regarding the importance of drinking water protection. These articles may include suggested BMPs for a target audience such as proper septic system maintenance, proper lawn and garden care or water conservation methods for homeowners. DAR's Water Well-Being website (www.mass.gov/agr/waterwellbeing/waterfacts.htm) is a source for useful information regarding water conservation and smart water use for homeowners.

Of particular importance to the water supply protection areas is the need to increase watershed awareness and protection in the Towns of Belchertown, Leverett, Pelham, and Shutesbury. Communication and cooperation with these Towns is essential to ensuring that the Town of Amherst continues to supply safe drinking water to the residents of Amherst.

SECTION 8 ABBREVIATIONS AND ACRONYMS

Tighe&Bond

APR	Agricultural Preservation Restriction
ATV	All-terrain Vehicle
BMP	Best Management Practice
BWSC	Bureau of Waste Site Cleanup
CMR	Code of Massachusetts Regulations
CR	Conservation Restriction
DAR	Department of Agricultural Resources
DCR	Department of Conservation and Recreation
DPW	Department of Public Works
EOEA	Executive Office of Environmental Affairs
ERP	Emergency Response Plan
FRCOG	Franklin Regional Council of Governments
gpd	gallons per day
IWPA	Interim Wellhead Protection Area
MADEP	Massachusetts Department of Environmental Protection
MassGIS	Massachusetts Geographic Information System
M&M	Metacomet-Monadnock Trail
MDC	Metropolitan District Commission
mgd	million gallons per day
NGVD	National Geodetic Vertical Datum
PCS	Potential Contamination Source
PWS	Public Water Supply
RFT	Robert Frost Trail
SWAP	Source Water Assessment & Protection Program
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VMP	Vegetation Management Plan
WMECO	Western Massachusetts Electric Company
YOP	Yearly Operational Plan

SECTION 9 REFERENCES

Tighe&Bond

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PELHAM RESERVOIR SYSTEM WATERSHED

MAP 1

MAP 2

MAP 3

MAP 4

MAP 5

BASE MAP

LAND USES

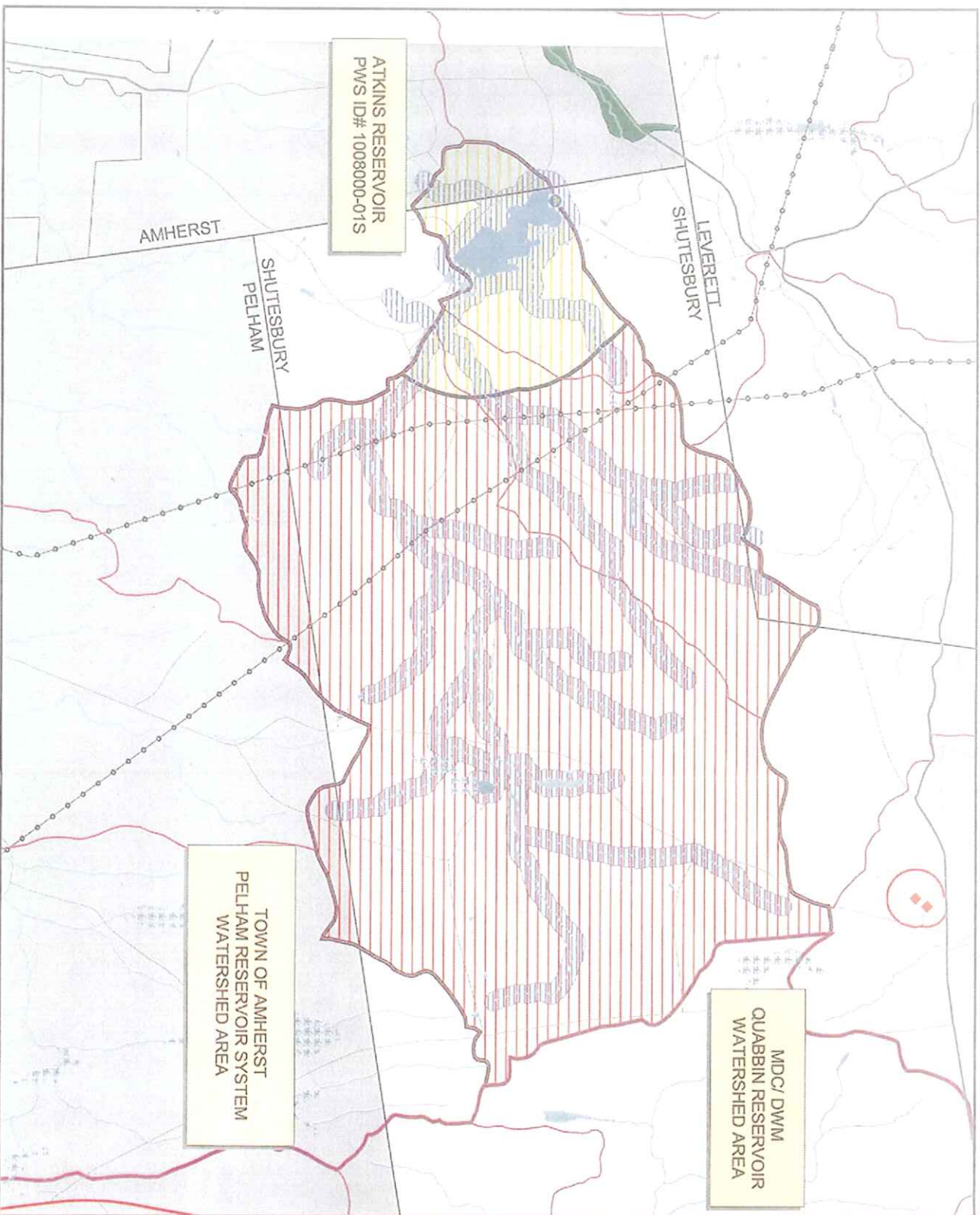
PROTECTED/RESTRICTED OPEN SPACE

ZONING

LAND TOPOGRAPHY

LAWRENCE SWAMP AQUIFER

MAP 1	BASE MAP
MAP 2	LAND USES
MAP 3	PROTECTED/RESTRICTED OPEN SPACE
MAP 4	ZONING
MAP 5	LAND TOPOGRAPHY



Watershed Characteristics

- MA Towns
- Public Surface Water Supply
- Stream
- Intermittent Stream
- Wetland / Salt Marsh
- Comberry Bog
- Surface Water
- Tidal Flat
- Impoundment
- Dam
- Freshwater non-forested Wetlands
- Salt Water Wetland
- Bay Estuary or Other Salt Water Feature (Saltmarsh, TidalFlat)

Water Supplies

- Community Public Water Supply - Surface water
- Community Public Water Supply - Groundwater
- Non-Community Non-Transient PWS
- Non-Community Transient PWS

Protection Zones

- Zone A
- Zone B
- Zone C
- Zone I/c
- IW/PAs
- Drainage Basins
- Major Basins
- Sub-basins

Roadways

- Limited Access Highway
- Multi-Lane Highway, NOT Limited Access
- Other Numbered Hwy
- Major Road - Connector
- Minor Street or Road
- Track or Trail
- Transmission Lines
- Railroads

Zoning

- Residential
- Commercial
- Industrial
- Restricted
- Other

MAP 4

MASS GIS MAPPING ZONING

SURFACE WATER SUPPLY PROTECTION PLAN

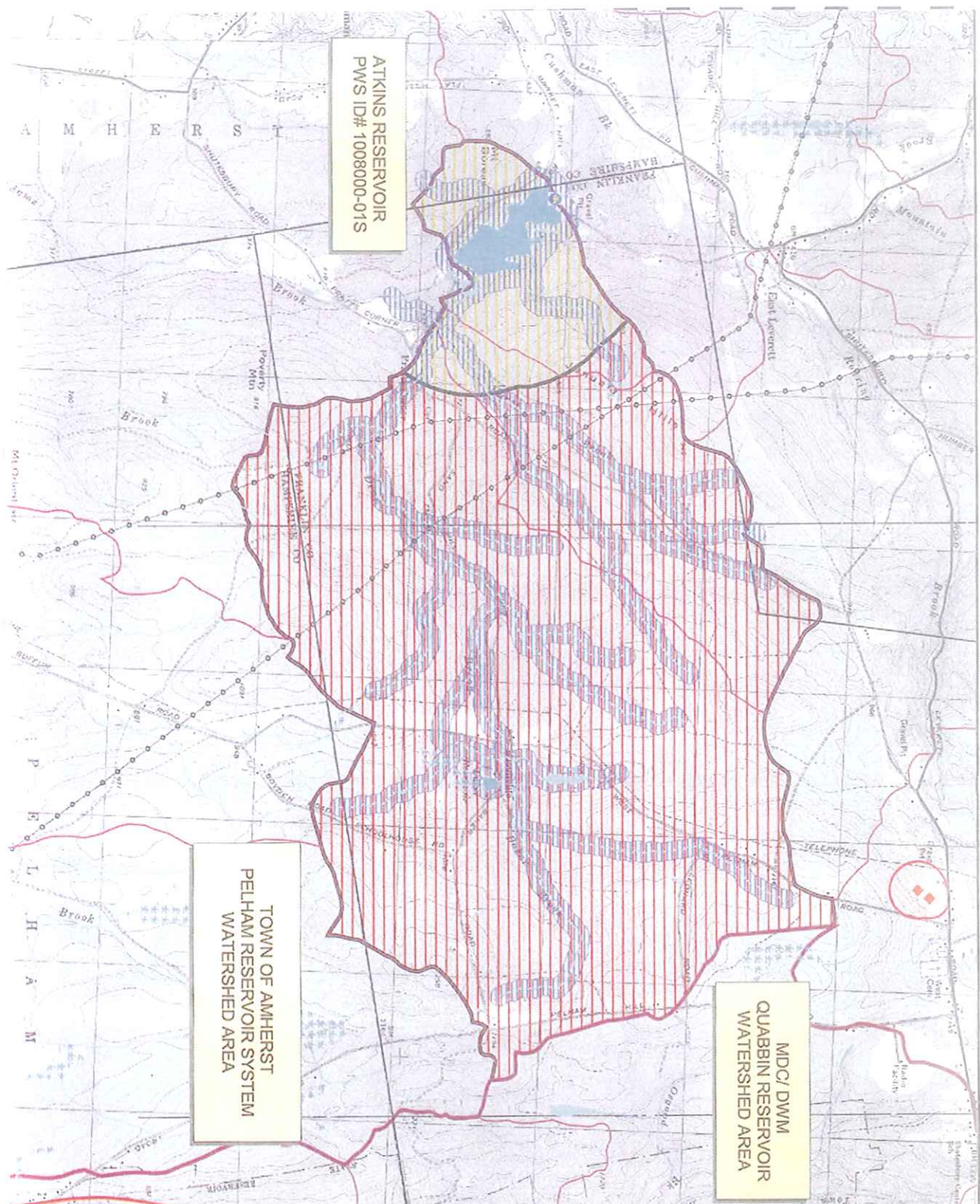
ATKINS RESERVOIR

AMHERST, MASSACHUSETTS

Tighe&Bond

September 2002

SCALE : 1 : 25 000



ATKINS RESERVOIR
PWS ID# 1008000-01S

TOWN OF AMHERST
PELHAM RESERVOIR SYSTEM
WATERSHED AREA

MDC/ DWM
QUABBIN RESERVOIR
WATERSHED AREA

Watershed Characteristics

- MA Towns
- Public Surface Water Supply
- Stream
- Intermittent Stream
- Wetland / Salt Marsh
- Cranberry Bog
- Surface Water
- Tidal Flat
- Impoundment
- Dam
- Freshwater non-forested Wetlands
- Salt Water Wetland
- Bay Estuary or Other Salt Water Feature (Saltmarsh, Tidal Flat)

Water Supplies

- Community Public Water Supply - Surface water
- Community Public Water Supply - Groundwater
- Non-Community Non-Transient PWS
- Non-Community Transient PWS

Protection Zones

- Zone A
- Zone B
- Zone C
- Zone IIs
- IWPAS

Drainage Basins

- Major Basins
- Sub-basins

MAP 5
MASS GIS MAPPING
TOPOGRAPHY

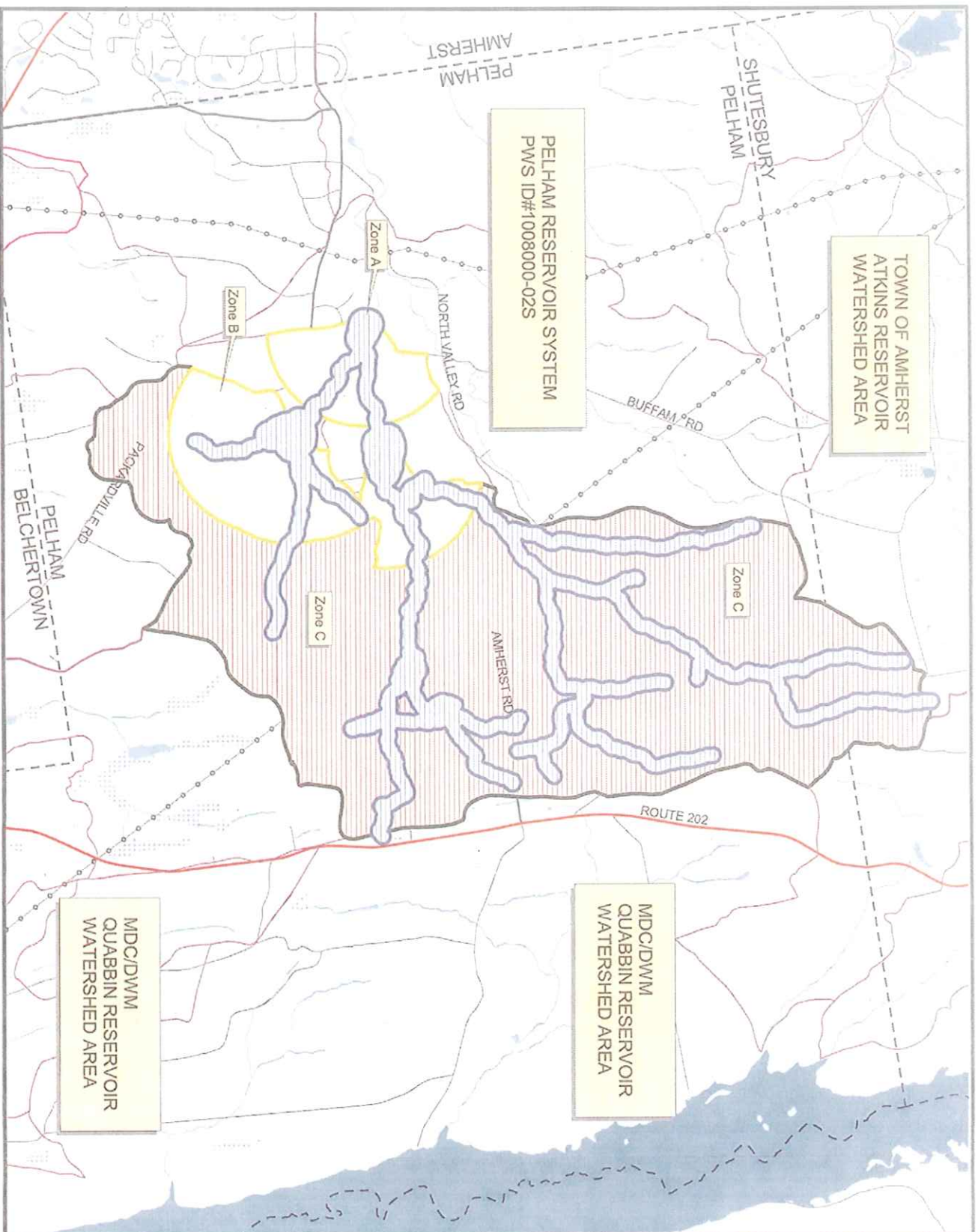


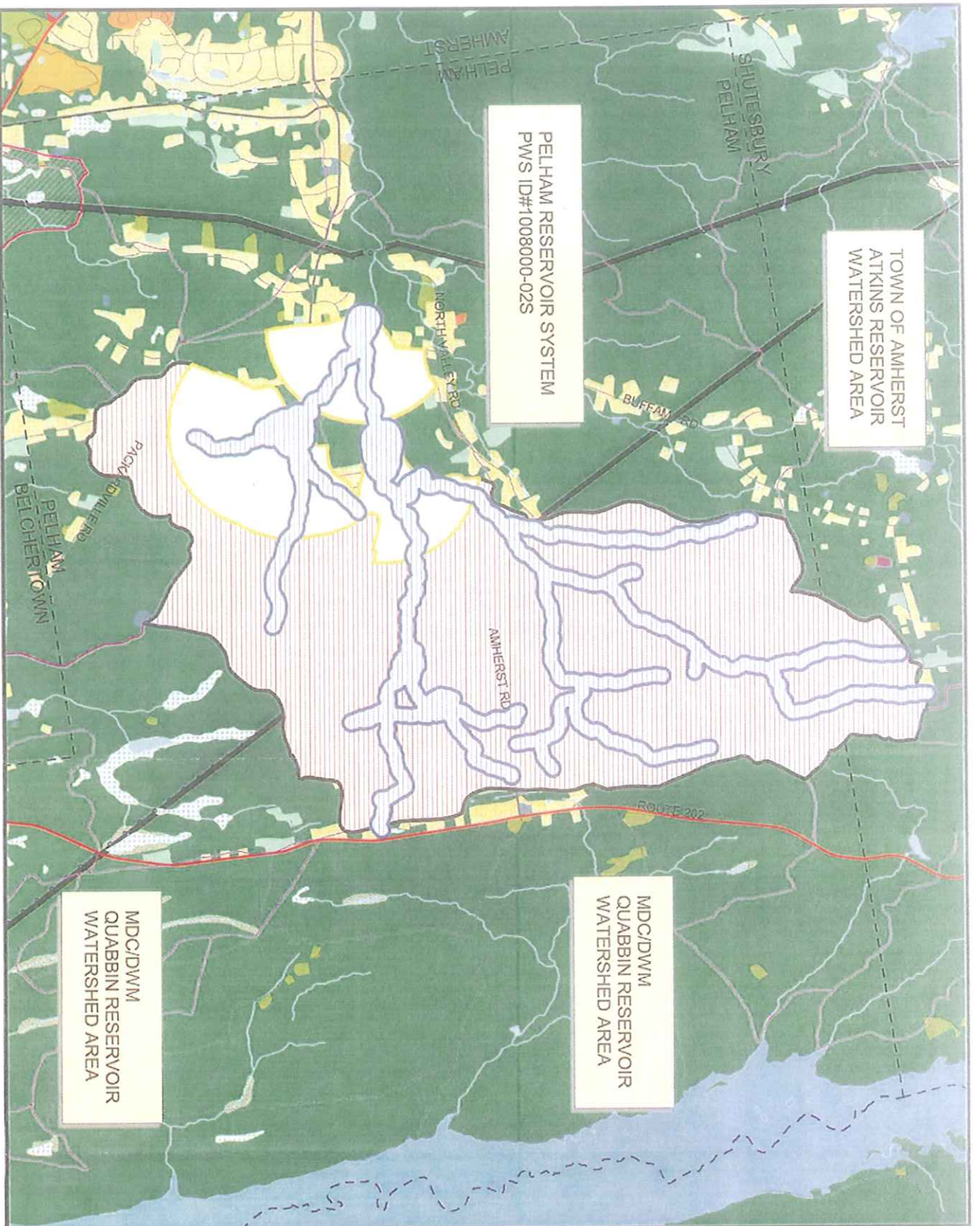
SURFACE WATER SUPPLY
PROTECTION PLAN
ATKINS RESERVOIR
AMHERST, MASSACHUSETTS

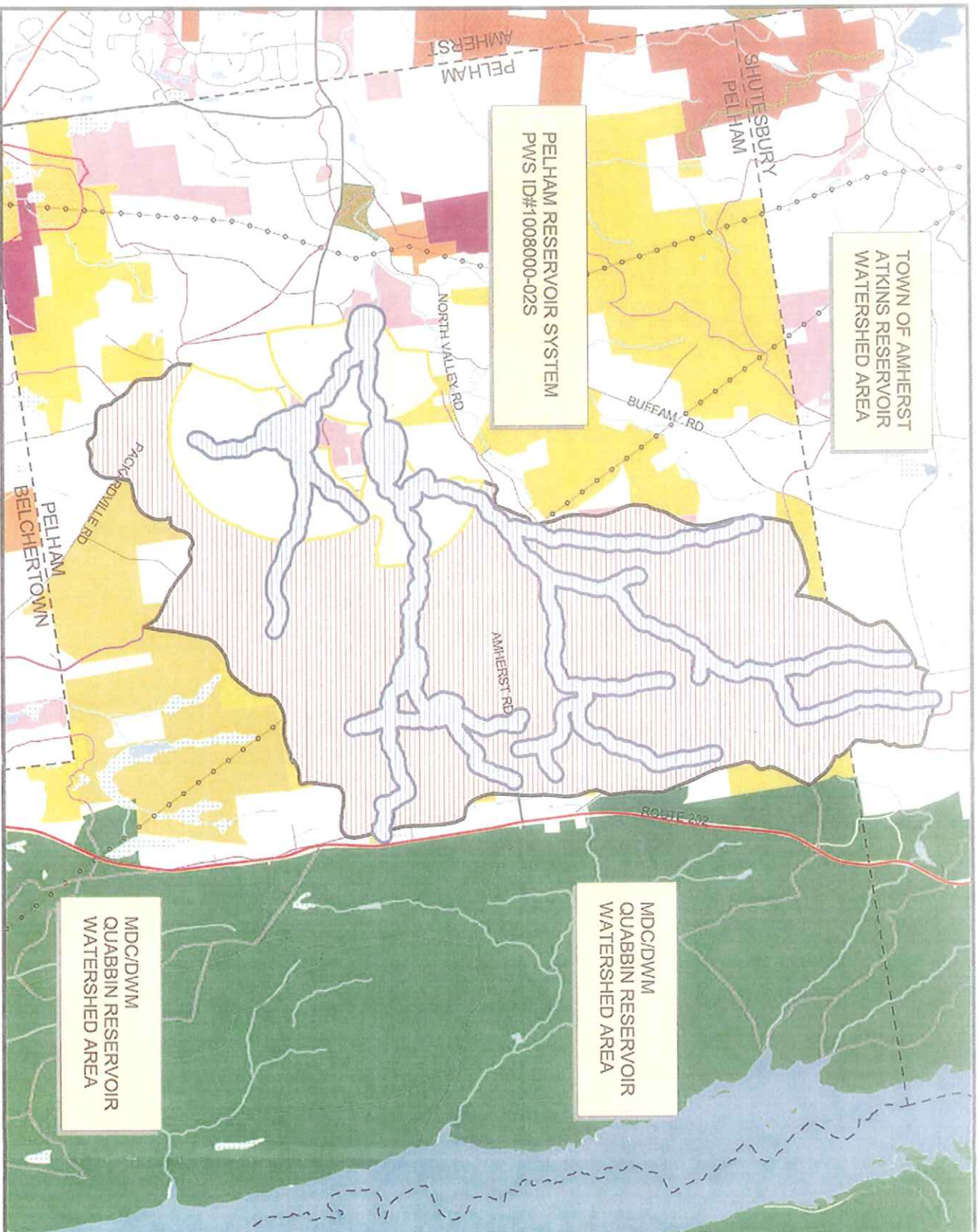
Tighe&Bond

SC04 E 1 25 003

11 SEP 2004







TOWN OF AMHERST
ATKINS RESERVOIR
WATERSHED AREA

PELHAM RESERVOIR SYSTEM
PWS ID#1008000-02S

MDC/DWM
QUABBIN RESERVOIR
WATERSHED AREA

MDC/DWM
QUABBIN RESERVOIR
WATERSHED AREA

Watershed Characteristics

- Freshwater non-forested Wetlands
- Salt Water Wetland
- Public Surface Water Supply
- Lake, Pond, Stream (Fresh Water Features)
- Wetlands, L&P
- Agarducis
- Rivers & Streams

Water Supplies

- Community Public Water Supply - Surface water
- Community Public Water Supply - Groundwater
- Non-Community Non-Transient PWS
- Non-Community Transient PWS

Ownership by Ownership

- CH61 (FORESTRY)
- CH61A (AGRICULTURE)
- CH61B (RECREATION)
- DEM
- DRIVELE
- MDC
- OTHER STATE
- COUNTY
- MUNICIPAL
- FEDERAL
- PRIVATE, NOT CHAPTER 61
- PRIVATE NON-PROFIT
- PUBLIC NON-PROFIT
- UNKNOWN
- OTHER

OpenSpace Restrictions

- Conservation Restriction
- Agricultural Preservation Restriction
- OR / APR

Drainage Basins

- Major Basins
- Sub-basins

Roads

- Limited Access Hwy
- Multi-Lane Highway
- Other Numbered Hwy
- Major Road
- Minor Street or Road
- Track or Trail
- Trains

Protection Zones

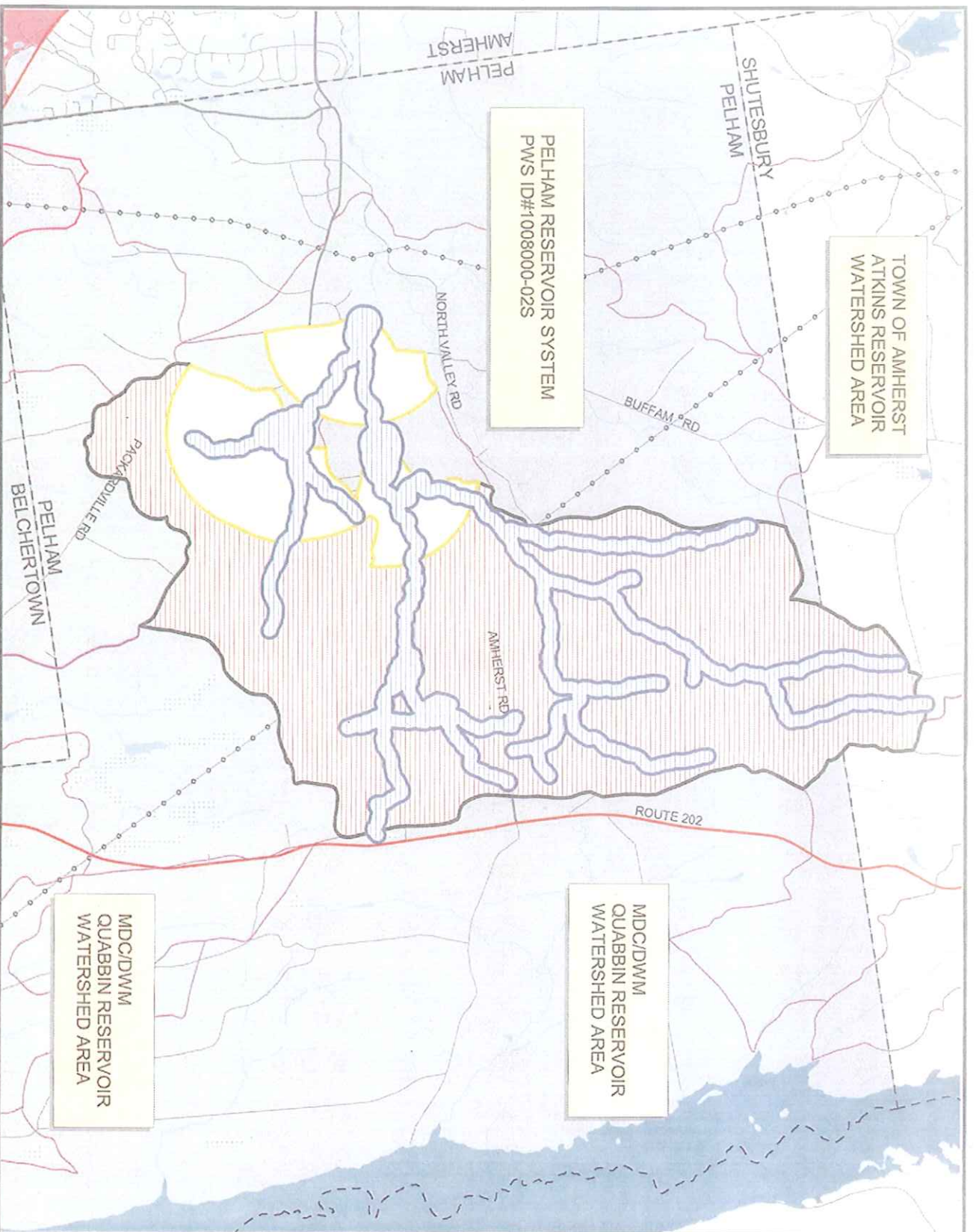
- Zone A
- Zone B
- Zone C
- IWPAs
- Zone IIs

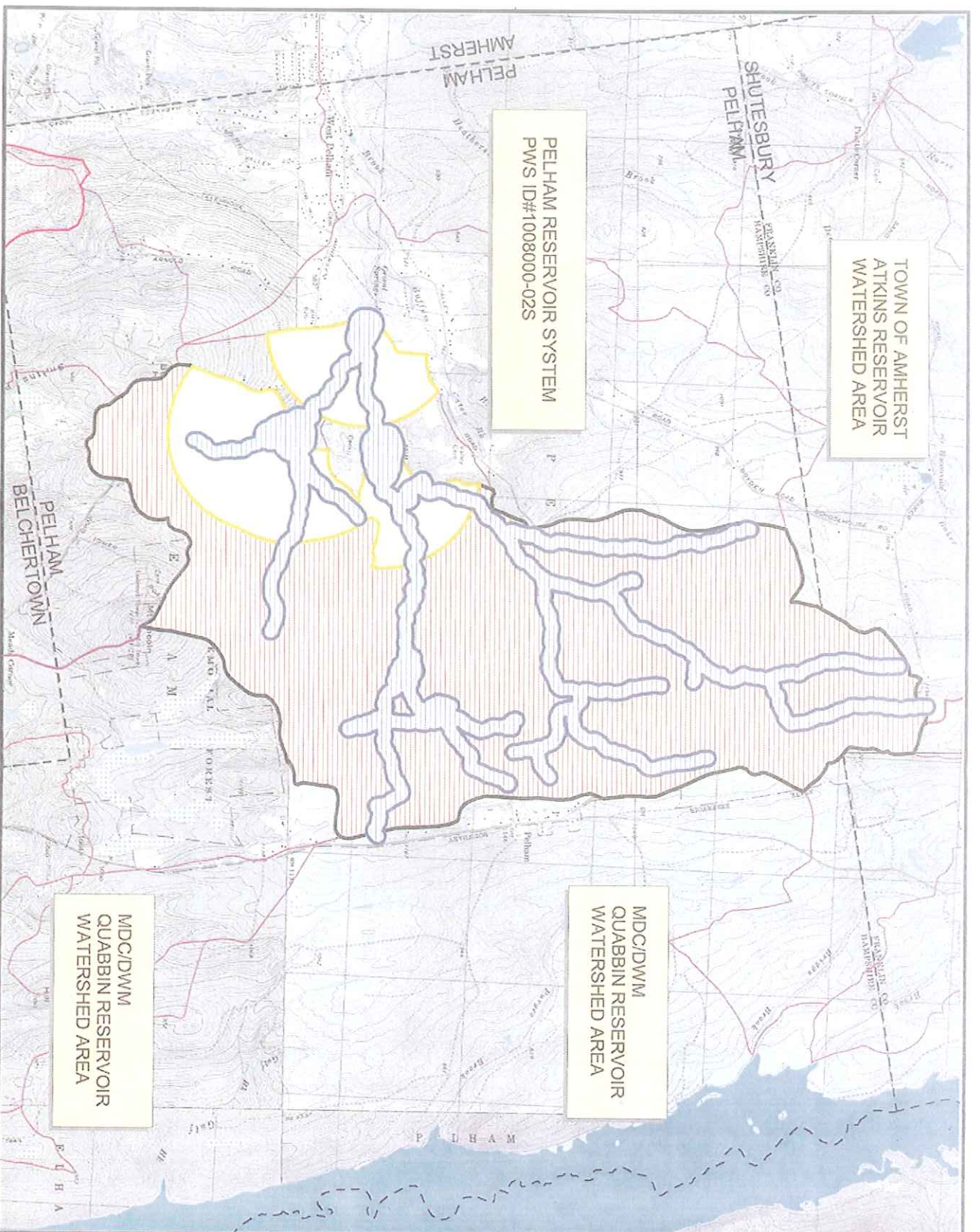
MassGIS Data from February 2002.

FIGURE 3
MASS GIS MAPPING
PROTECTED OPEN SPACE

SURFACE WATER SUPPLY
PROTECTION PLAN
PELHAM RESERVOIR SYSTEM
AMHERST, MASSACHUSETTS

Tighe&Bond
SCALE: 1:30,000
MARCH 2005





TOWN OF AMHERST
ATKINS RESERVOIR
WATERSHED AREA

PELHAM RESERVOIR SYSTEM
PWS ID#1008000-02S

MDC/DWM
QUABBIN RESERVOIR
WATERSHED AREA

MDC/DWM
QUABBIN RESERVOIR
WATERSHED AREA

Watershed Characteristics:
Freshwater non-forested Wetlands
Salt Water Wetland
Public Surface Water Supply
Lake, Pond, Stream (Fresh Water Features)
Wetlands L&P
Aqueducts
Rivers & Streams

Water Supplies
Community Public Water Supply - Surface water
Community Public Water Supply - Groundwater
Non-Community Non-Transient PWS
Non-Community Transient PWS

Protection Zones

Zone A
Zone B
Zone C
IWPA's
Zone IIS

Drainage Basins

Major Basins
Sub-basins

Based on USGS topographic maps for
Shutesbury, Quabbin Reservoir,
Belchertown & Windsor Dam, MA quadrangles
Revised respectively 1990, 1990, 1979, 1967
Contour intervals respectively
3-meter, 3-meter, 10-foot & 10-foot
MassGIS Data from February 2002.

FIGURE 5
MASS GIS MAPPING
TOPOGRAPHY



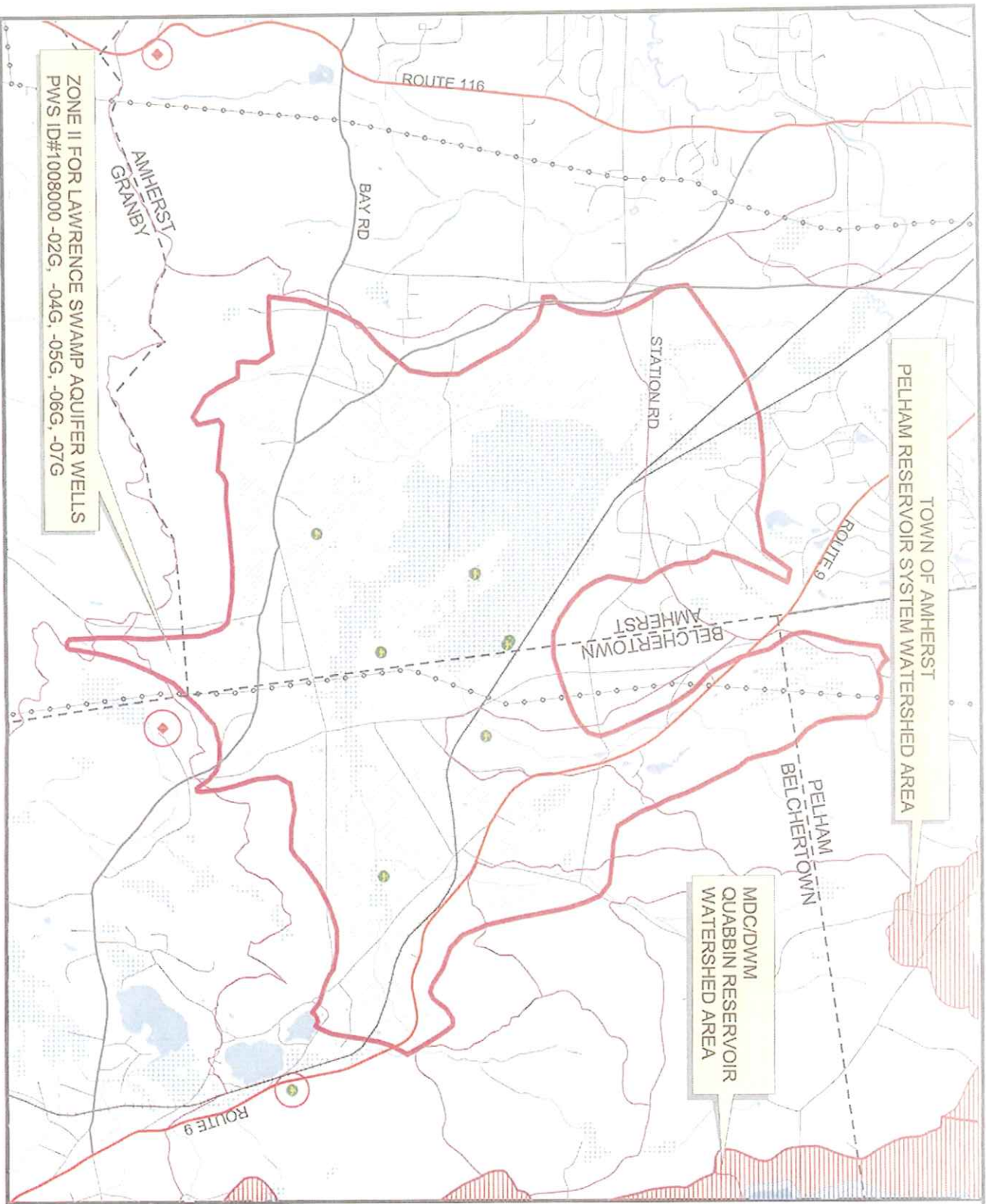
SURFACE WATER SUPPLY
PROTECTION PLAN
PELHAM RESERVOIR SYSTEM
AMHERST, MASSACHUSETTS

Tighe & Bond

SCALE: 1:30,000

MARCH 2005

4/20/2005/05/05/05/05



ZONE II FOR LAWRENCE SWAMP AQUIFER WELLS
PWS ID#1008000 -02G, -04G, -05G, -06G, -07G

TOWN OF AMHERST
PELHAM RESERVOIR SYSTEM WATERSHED AREA

MDC/DWM
QUABBIN RESERVOIR
WATERSHED AREA

Watershed Characteristics:

- Freshwater non-forested Wetlands
- Salt Water Wetland
- Public Surface Water Supply
- Lake, Pond, Stream (fresh Water Features)
- Wetlands L&P
- Aqueducts
- Rivers & Streams

Water Supplies

- Community Public Water Supply - Surface water
- Community Public Water Supply - Groundwater
- Non-Community Non-Transient PWS
- Non-Community Transient PWS

Protection Zones

- Zone A
- Zone B
- Zone C
- Zone D
- Zone E
- Zone F
- Zone G
- Zone H
- Zone I
- Zone J
- Zone K
- Zone L
- Zone M
- Zone N
- Zone O
- Zone P
- Zone Q
- Zone R
- Zone S
- Zone T
- Zone U
- Zone V
- Zone W
- Zone X
- Zone Y
- Zone Z

Roads

- Limited Access Highway
- Multi-Lane Highway, NOT Limited Access
- Other Numbered Hwy
- Major Road - Connector
- Minor Street or Road
- Track or Trail
- Trains

Pipeline & Powerline

- Pipeline
- Powerline

Town Boundary

- Town Boundary

Drainage Basins

- Major Basins
- Sub-basins

MassGIS Data from February 2002

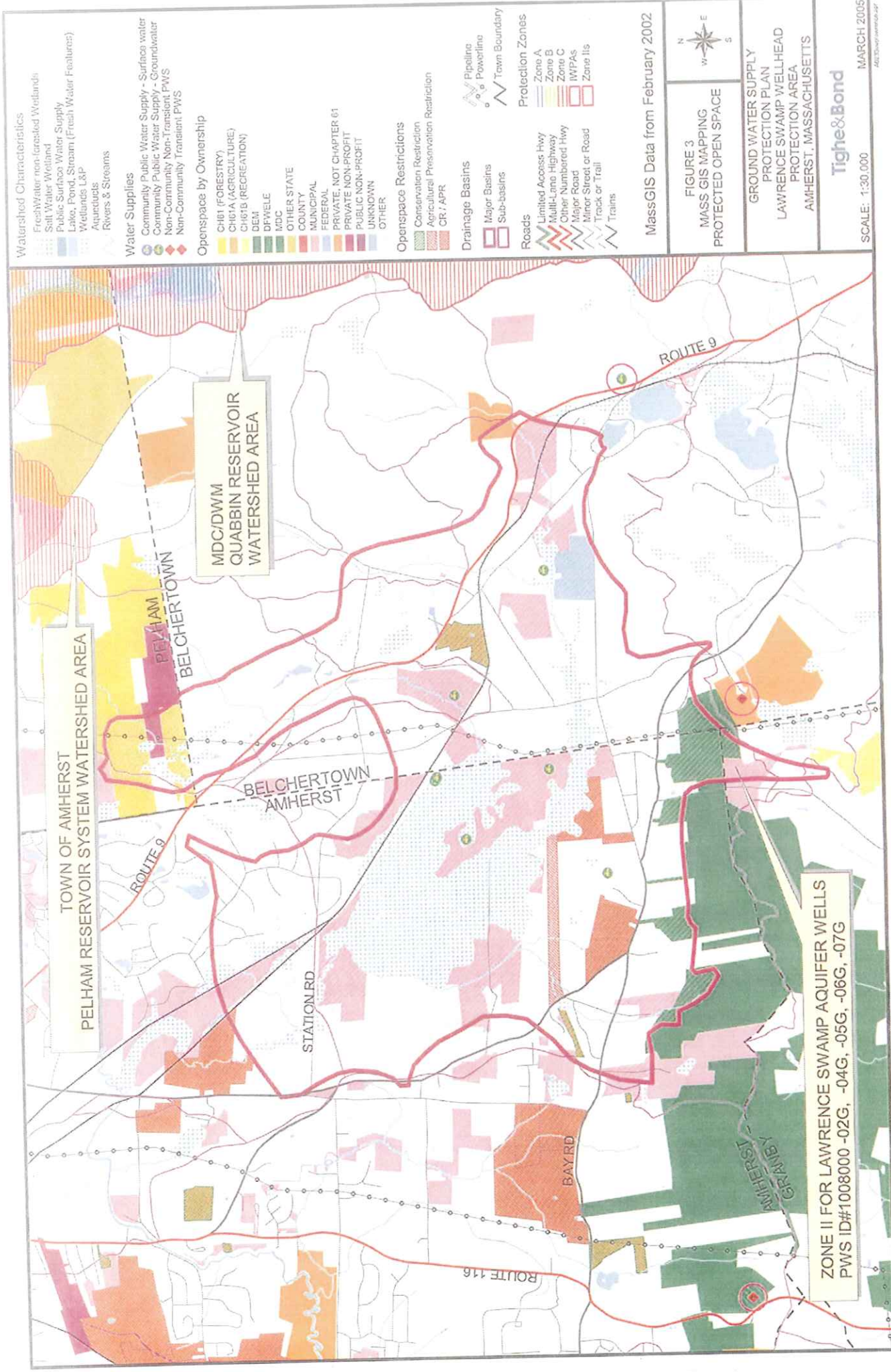
FIGURE 1
MASS GIS MAPPING
BASE MAP

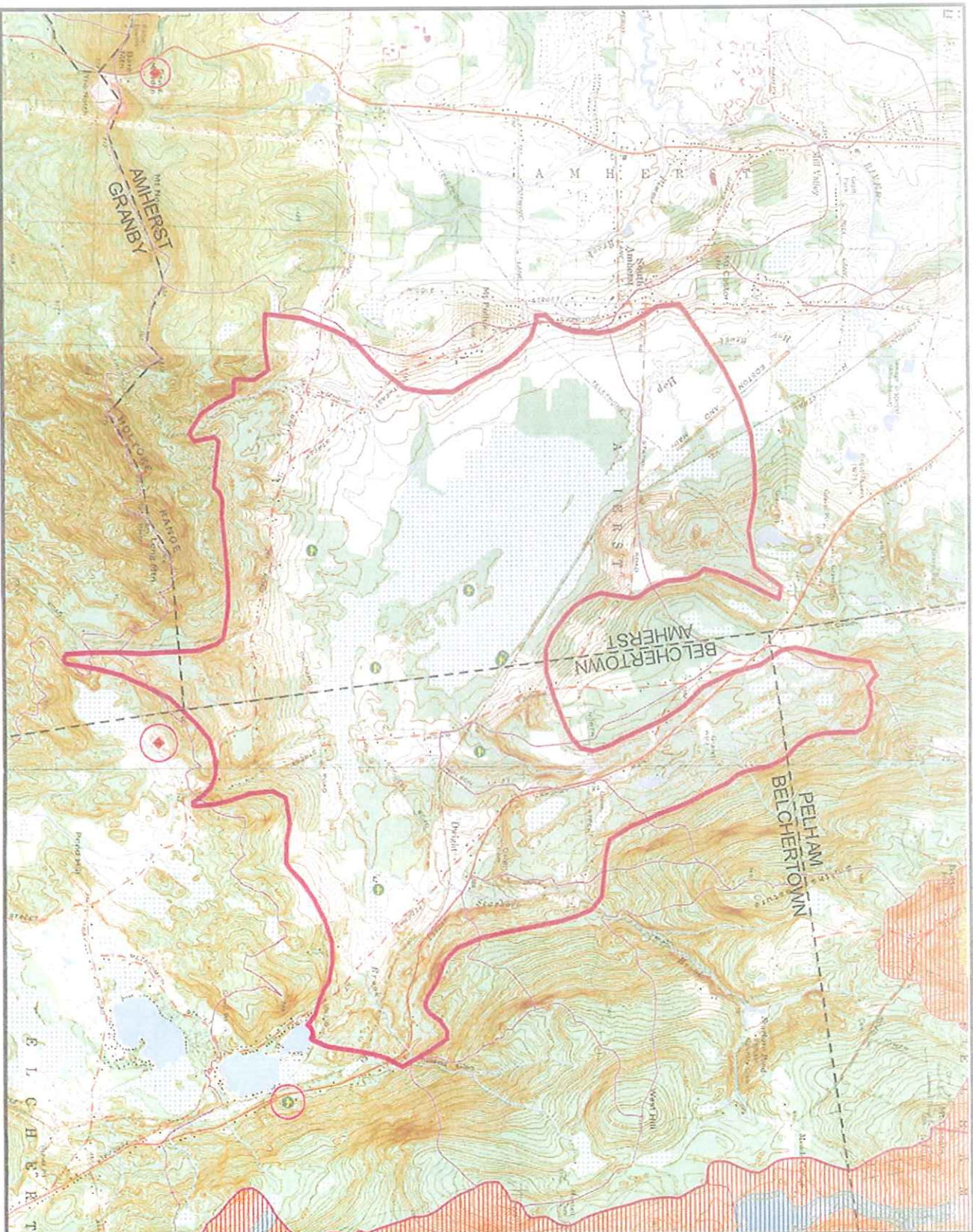
GROUND WATER SUPPLY
PROTECTION PLAN
LAWRENCE SWAMP WELLS
PROTECTION AREA
AMHERST, MASSACHUSETTS

Tighe & Bond

SCALE: 1:30,000

MARCH 2005

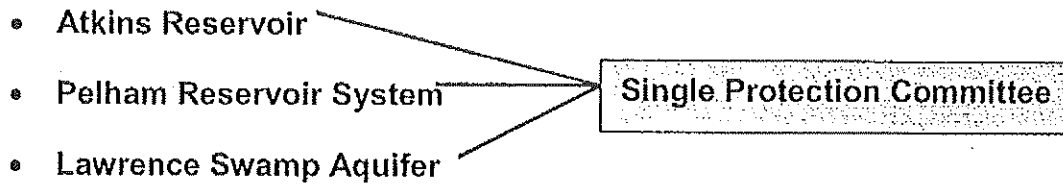




Appendix B

Water Supply Protection Committee Member List

The Town of Amherst currently maintains an Aquifer Protection Committee that will serve as the Water Supply Protection Committee.



The current members of the Committee are listed below:

- Chadwick Johnson
- Stephen Mabee (Chair)
- Michelle Mateo
- Ward Motts (Associate)
- W. Jesse Schwalbaum
- Lyons Witten
- Guilford Mooring (Staff Liaison)
- Robert Pariseau (Staff Liaison)

POTENTIAL THREATS TO SURFACE WATER SOURCES

Potential Threats to Surface Water Sources

(based on MADEP's SWAP Land Use Pollution Potential Matrix)

Land Use	Threat	Potential Contaminant Sources
High Risk Threats		
Aquatic Wildlife	H	Microbial contaminants
Boat Yards/Builders	H	Spills, leaks, or improper handling of fuels, paints, and solvents
Chemical Manufacture Or Storage	H	Spills, leaks, or improper handling or storage of chemicals and process wastes
Clandestine (Illegal) Dumping	H	Debris containing hazardous materials or wastes
Combined Sewer Overflows	H	Microbial and non-microbial contaminants including industrial wastewater, improper disposal of hazardous wastes
Dairy Farms	H	Improper handling of manure (microbial contaminants)
Dredge Disposal Facilities	H	Improper seepage or handling of dredge materials
Fuel Oil Distributors	H	Spills, leaks, or improper handling or storage of fuel oil
Gasification Plants (Oil Or Coal)	H	Spills, leaks, or improper handling or storage of oil and process residuals
Hazardous Materials Storage	H	Spills, leaks, or improper handling or storage of hazardous materials
Hazardous Waste Storage, Treatment and Recycling	H	Spills, leaks, or improper handling or storage of hazardous materials
Industrial Lagoons and Pits	H	Improper seepage or overflows of liquid wastes
Industry/Industrial Parks	H	Spills, leaks, or improper handling or storage of industrial chemicals and metals
Junk Yards and Salvage Yards	H	Spills, leaks, or improper handling of automotive chemicals, wastes, and batteries
Landfills and Dumps	H	Seepage or leachate
Large Quantity Hazardous Waste Generators	H	Spills, leaks, or improper handling or storage of hazardous materials and waste
Livestock Operations	H	Improper handling of manure (microbial contaminants)
Manure Storage or Spreading	H	Improper handling of manure (microbial contaminants)
Metal and Drum Cleaning/Reconditioning	H	Spills, leaks, or improper handling or storage of residual chemicals in used drums and solvents
Military Facilities (Past And Present) Type _____	H	Spills, leaks, or improper handling or storage of pesticides and herbicides, fuel, chemicals and other materials; may include ordnance or waste landfill/dump sites
NPDES Locations	H	Improper disposal of hazardous material and wastes
Nuclear Power Plants	H	Spills, leaks, or improper handling of radioactive materials
Oil or Hazardous Material Sites	H, M, L	Tier Classified Oil or Hazardous Materials Sites are not ranked due to their site-specific character. Individual sites are identified in Appendix B.
Paper Manufacturers	H	Spills, leaks, or improper handling or storage of bleaches, dyes, waste products, and other chemicals
Pesticide Storage or Use	H	Leaks, spills, improper handling, or over-application of pesticides
Petroleum Storage Facilities / Fossil Fuel Power Plants	H	Spills, leaks, or improper handling, or storage of petroleum products and equipment maintenance chemicals
Pharmaceutical Manufacturers	H	Spills, leaks, or improper handling and or storage of chemicals
Plastic Manufacturers	H	Spills, leaks, or improper handling or storage of solvents, resins and process wastes
Railroad Tracks And Yards	H	Over-application or improper handling of herbicides, leaks or spills of transported chemicals and maintenance chemicals; fuel storage
RCRA TSDF Facilities	H	Spills, leaks, or improper handling or storage of hazardous wastes
Rust Proofing	H	Spills, leaks, or improper handling or storage of rust proofing chemicals, solvents, and automotive paint residuals
Slaughterhouses	H	Improper handling of manure and other waste products; microbial contaminants
Stormwater Drains/ Retention Basins	H	Debris, pet waste, and chemicals in stormwater from roads, parking lots, and lawns

Tannery/Leather Manufacturers	H	Spills, leaks, or improper handling or storage of manufacturing chemicals and wastes
Textile Manufacturers	H	Spills, leaks, or improper handling or storage of manufacturing chemicals
Transmission Line Right-of-Way - Type	H	Construction and corridor maintenance, over-application or improper handling of pesticides
Transportation Corridors	H	Accidental leaks or spills of fuels and other hazardous materials, over-application or improper handling of pesticides
Waste Incinerator	H	Improper management and seepage of water contacting waste materials; ash disposal
Wastewater Treatment Plant/Collection Facility/Lagoon	H	Improper handling or storage of treatment chemicals or equipment maintenance materials; improper management of wastewater
Medium Risk Threats		
Aboveground Storage Tanks	M	Spills, leaks, or improper handling of materials stored in tanks
Airports	M	Spills, leaks, or improper handling of fuels, de-icers, salt, and other hazardous chemicals
Asphalt, Coal Tar, And Concrete Plants	M	Spills, leaks, or improper handling or storage of hazardous chemicals and wastes
Bus and Truck Terminals	M	Spills, leaks, or improper handling of fuels and maintenance chemicals
Composting Facilities	M	Storage and improper handling of organic material, animal waste, and runoff
Dry Cleaners	M	Spills, leaks, or improper handling of solvents and wastes
Electronics/Electrical Manufacturers	M	Spills, leaks, or improper handling or storage of chemicals and process wastes
Electroplaters	M	Spills, leaks, or improper handling or storage of solvents and other chemicals
Fertilizer Storage or Use	M	Leaks, spills, improper handling, or over-application of fertilizers
Fire Training Facilities	M	Improper use or storage of fuels and other chemicals
Fishing/Boating	M	Fuel and other chemical spills, microbial contaminants
Forestry Operation	M	Leaks, spills, or improper handling of herbicides or pesticides, equipment maintenance materials, road building
Foundries Or Metal Fabricators	M	Spills, leaks, or improper handling or storage of solvents and other chemicals
Fuel Oil Storage (at residences)	M	Spills, leaks, or improper handling of fuel oil
Furniture Stripping and Refinishing	M	Spills, leaks, or improper handling of hazardous chemicals
Gas Stations	M	Spills, leaks, or improper handling or storage of automotive fluids and fuels
Golf Courses	M	Over-application or improper handling of fertilizers or pesticides
Jewelry or Metalplating	M	Spills, leaks, or improper handling or storage of solvents, other chemicals, and process wastes
Land Application Of Sewage Sludge	M	Improper management of sludge and runoff (metals)
Landscaping	M	Leaks, spills, improper handling, or over-application of fertilizers and pesticides
Lawn Care / Gardening	M	Over-application or improper storage and disposal of pesticides
Machine/Metalworking Shops	M	Spills, leaks, or improper handling of solvents and metal tailings
Nurseries	M	Leaks, spills, improper handling, or over-application of fertilizers, pesticides, and other chemicals
Paint Shops	M	Spills, leaks, or improper handling or storage of paints, solvents, other chemicals
Photo Processors	M	Spills, leaks, or improper handling or storage of photographic chemicals
Pipeline (Oil and sewer)	M	Spills or leaks of oil
Printer And Blueprint Shops	M	Spills, leaks, or improper handling or storage of printing inks and chemicals
Prisons	M	Spills, leaks, or improper handling or storage of solvents, microbial waste, and other chemicals

Repair Shops(Engine, Appliances, Etc.)	M	Spills, leaks, or improper handling or storage of engine fluids, lubricants, and solvents
Research Laboratories	M	Spills, leaks, or improper handling or storage of laboratory chemicals and wastes
Road And Maintenance Depots	M	Spills, leaks, or improper handling or storage of deicing materials, automotive fluids, fuel storage, and other chemicals
Sand And Gravel Mining/Washing	M	Spills or leaks from heavy equipment, fuel storage, clandestine dumping
Schools, Colleges, and Universities	M	Spills, leaks, or improper handling or storage of fuel oil, laboratory, art, photographic, machine shop, and other chemicals
Sepic Systems / Cesspools	M	Microbial contaminants, and improper disposal of hazardous chemicals
Service Stations/Auto Repair Shops	M	Spills, leaks, or improper handling of automotive fluids, and solvents
Snow Dump	M	Improper handling of melt water containing de-icing and other chemicals from roads and parking lots
Tire Dumps	M	Improper handling or management of tires
Underground Storage Tanks	M	Spills, leaks, or improper handling of stored materials
Utility Substation Transformers	M	Spills, leaks, or improper handling of chemicals and other materials including PCBs
Waste Transfer/Recycling Station	M	Improper management, seepage, and runoff of water contacting waste materials
Wood Preserving Facilities	M	Spills, leaks, or improper handling or storage of wood preservatives
Car/Truck/Bus Washes	L	Low Risk Threats Improper management of vehicle wash water, soaps, oils, greases, metals, salts
Cemeteries	L	Leaks, spills, improper handling, or over-application of pesticides; historic embalming fluids
Food Processors	L	Spills, leaks, or improper handling or storage of cleaners and other chemicals; microbial contaminants
Funeral Homes	L	Spills, leaks, or improper handling of hazardous chemicals
Laundromats	L	Improper management of wash water
Medical Facilities	L	Spills, leaks, or improper handling or storage of biological, chemical, and radioactive wastes
Nursing Homes	L	Microbial contaminants
Small quantity hazardous waste generators	L	Spills, leaks, or improper handling or storage of hazardous materials and waste
Very Small Quantity Hazardous Waste Generator	L	Spills, leaks, or improper handling or storage of hazardous materials and waste
Water Treatment Sludge Lagoon	L	Improper management of sludge and wastewater